



Joint  
Advanced  
Warfighting  
Program

INSTITUTE FOR DEFENSE ANALYSES

**Department of Defense Roadmap for  
Improving Capabilities for  
Joint Urban Operations**

**Volume II: MOUT Operational  
Concepts and Capabilities:  
The Joint Force  
Commander's Perspective**

Alec Wahlman

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## Preface

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This paper was prepared under the task order Joint Advanced Warfighting Program (JAWP). The primary sponsor was Deputy Assistant Secretary of Defense for Resources and Plans in the Office of the Under Secretary of Defense for Policy. The paper addresses the task order objective of generating advanced joint operational concepts and joint experimentation to assist the Department of Defense in transforming US military capabilities.

The author would like to acknowledge the contributions to this work by other members of the JAWP Urban Operations Team: Dr. William J. Hurley, task leader; Mr. Dennis J. Gleeson; Mr. Joel B. Resnick; Mr. Duane Schattle; and Colonel Thomas Sward, USMC.

The JAWP was established at the Institute for Defense Analyses (IDA) by the Office of the Secretary of Defense and the Joint Staff to serve as a catalyst for stimulating innovation and breakthrough change. The JAWP Team is composed of military personnel on joint assignments from each Service and civilian analysts from IDA. The JAWP is located principally in Alexandria, Virginia, and includes an office in Norfolk, Virginia, that facilitates coordination with the United States Joint Forces Command.

This paper does not necessarily reflect the views of IDA or the sponsors of the JAWP. Our intent is to stimulate ideas, discussion, and, ultimately, the discovery and innovation that must fuel successful transformation.



## Contents

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I.	Introduction.....	I-1
A.	Background .....	I-1
B.	Purpose of This Paper.....	I-2
C.	Plan of This Document .....	I-3
II.	Operational Concepts.....	II-1
III.	Needed Capabilities .....	III-1
IV.	Urban Combat Variables.....	IV-1
V.	Patterns in Operational Concepts and Capabilities.....	V-1
A.	Rubble-ize .....	V-1
B.	Siege.....	V-1
C.	Frontal Assault.....	V-1
D.	Nodal Capture and Expansion .....	V-1
E.	Soft-Point Capture and Expansion.....	V-2
F.	Segment and Capture/Isolate .....	V-3
G.	Precision Strike .....	V-4
H.	Nodal Isolation .....	V-4
I.	The Patterns in Operational Concepts and Capabilities.....	V-5
VI.	Conclusions.....	VI-1
A.	Traditional vs. Emerging Operational Capabilities .....	VI-1
B.	Needed Capabilities for MOUT.....	VI-2
	Appendix A. Operational Concepts and Needed Capabilities.....	A-1
	Appendix B. Summary of Needed Capabilities and Current Grades .....	B-1
	Appendix C. Summary of Urban Variable Impacts .....	C-1
	Appendix D. Remaining Missions and Related Operational Concepts .....	D-1
	Appendix E. Relationship Between the Urban Roadmap and the Joint Warfight- ing Science and Technology Plan.....	E-1
	Appendix F. Bibliography.....	F-1
	Appendix G. Glossary .....	G-1

## Illustrations

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Figure I-1. Mission – Operational Concept – Capability Relationship .....	I-3
Figure II-1. Types of Operational Concepts (CAPTURE AN URBAN AREA) .....	II-1
Figure V-1. Capability Demands for Traditional and New Operational Concepts .....	V-7
Figure A-1. Types of Operational Concepts (Capture an Urban Area) .....	A-2
Figure D-1. Types of Operational Concepts (CAPTURE AN URBAN AREA) .....	D-3
Figure D-2. Summary of Operational Concepts Not Addressed Under Capture an Urban Area .....	D-9
Table D-1. Types of Urban Missions .....	D-3



**Volume II.**  
**MOUT Operational Concepts and**  
**Capabilities: The Joint Force**  
**Commander's Perspective**



## I. Introduction

---

### A. Background

The US military prefers to avoid operations in urban terrain (MOUT) and with good reason.<sup>1</sup> The clutter of the terrain makes standoff detection and engagement extremely difficult. This turns much of the combat into a close-range force protection nightmare where the weapons of choice are the rifle and rocket-propelled grenade (RPG). The complexity and depth of the landscape tends to swallow up seemingly unlimited numbers of troops.<sup>2</sup> The abundance of civilians and civilian infrastructure in the city forces a choice between restrictive rules of engagement (ROE) or high political costs from civilian casualties and collateral damage. All of these factors make MOUT messy, costly, resource intensive, and slow.

Unfortunately, avoidance of urban operations will not be a consistent option in the future.<sup>3</sup> A range of factors (e.g., demographics, likely mission types) will make urban environments common in the future, foremost being the obvious lack of capability for MOUT by the US military. Much like David choosing to fight Goliath in a manner most to David's advantage, future foes will choose the urban environment because that is where they stand their best chance.<sup>4</sup> And therein lies the basic problem—the divergence between the supply and demand of MOUT capabilities.

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<sup>1</sup> A 2000 study on MOUT directed by the US Army's TRADOC (Training and Doctrine Command) summed up the majority opinion in today's leading armies as "Wars are never won in cities, and quite a few have been lost in them." Roger J. Spiller, *Sharp Corners: Urban Operations at Century's End* (Ft. Leavenworth, Kansas: US Army Command and Staff College Press, 2000): p. 3.

<sup>2</sup> A 1997 article from the Marine Corps Combat Development Command stated that it was unlikely that future MOUT operations would have sufficient forces allocated to conduct the operation in the traditional manner. LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," *Marine Corps Gazette* (October 1997): p. A5.

"The global trend toward larger, denser urban cores and vast areas of peripheral suburban sprawl has made it unlikely that the enemy will be capable of defending the perimeter of an entire city. Instead, the enemy will choose or be forced to defend in select urban pockets where they have a strong local support establishment or have had time to prepare defenses." US Marine Corps Warfighting Laboratory. *Project Metropolis: Military Operations on Urbanized Terrain Battalion Level Experiments—Experiment After Action Report* (February 2001): p. 5.

<sup>3</sup> "Recent history declares that the next most likely mission environment is urban. Places like Tuzla, Mogadishu, Los Angeles, Beirut, Panama City, Hue, Saigon, Chechnya, Northern Ireland, and Lebanon underscore this historical fact. For example, of the last 250 USMC overseas deployments, 237 have involved urban operations." "Once thought to be an exception, MOUT is fast becoming the majority of missions conducted by forward-deployed forces." US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element: Military Operations on Urban Terrain Manual* (Yuma, AZ.: Marine Aviation Weapons and Tactics Squadron One, March 1999): pp. 1–2 to 1–3, 1–10.

<sup>4</sup> An interesting historical parallel can be found with the Mongols in the 13<sup>th</sup> century. Like the US military of today, they were largely unbeatable in open terrain. However, their one weakness was siege warfare. Opponents found that pulling back into fortified cities often provided the best chance of

## B. Purpose of This Paper

This paper has two purposes:

- ▶ **Operational concepts.** One is to explore a range of operational concepts for MOUT, some new and some old.<sup>5</sup> The older, more traditional operational concepts provide a historical baseline. The newer concepts have the goal of giving the United States significant advantages in the city, much like those currently enjoyed in open terrain. A common theme in all of these newer concepts is to exploit new capabilities for understanding and shaping in an urban environment.
- ▶ **Operational capabilities.** The second purpose of this paper is to look at the capabilities needed to realize these new operational concepts. Special attention is paid to those capabilities that are in high demand across all of the new, non-traditional operational concepts. As a part of that process, all of the capabilities arrived at in this paper are given a grade to reflect how close today's force is to meeting the need.<sup>6</sup> Then those supply-and-demand factors are compared to highlight the general areas in need of the most improvement.

Defining the best solution to achieve each capability listed is beyond the scope of this paper. What is safe to say is that the total solution set to acquire needed MOUT capabilities is going to be multifaceted and span across DOTMLPF.<sup>7</sup>

Certain demand patterns are clear across the range of operational concepts presented in this paper. For example, the non-traditional operational concepts require a higher degree of situational awareness and understanding, thus placing much more demand on ISR (intelligence, surveillance, and reconnaissance) assets. At the same time, the grades given to today's ISR capabilities are noticeably lower than in any other area. That would indicate that efforts directed at improving urban ISR would pay substantial dividends for future urban operational concepts.

This paper identifies nine generic urban missions that represent the range of missions a joint force commander (JFC) might be given, and examines them from an operational perspective. Figure I-1 on the next page shows the relationship in this paper between missions, operational concepts, and capabilities.

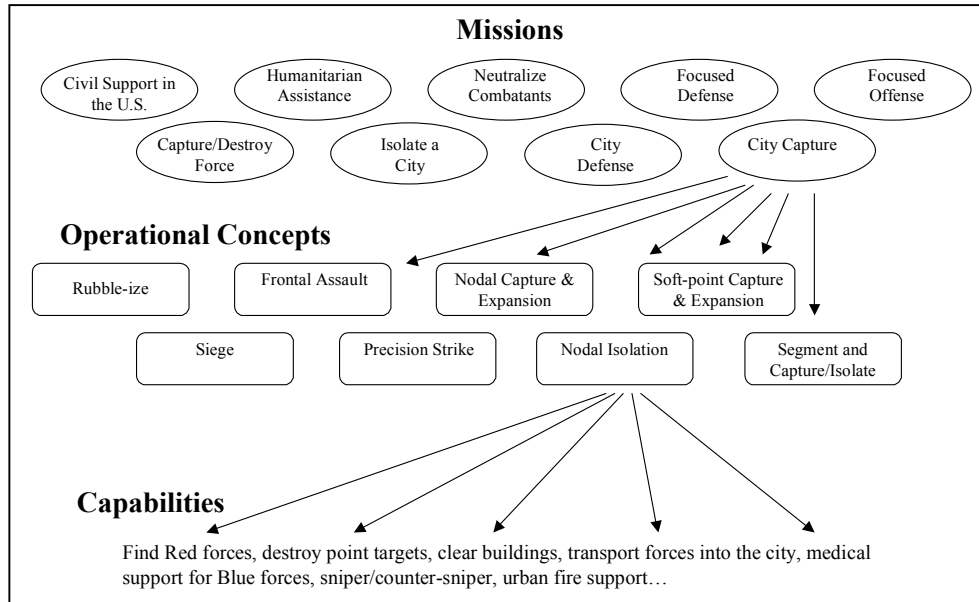
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success. It was not until the Mongols began to incorporate Chinese and Arab engineers into their army that they improved on this front. For a description of Mongol siege warfare, see Stephen Turnbull, *The Mongols* (Oxford, UK: Osprey, 1980), pp. 28–31.

<sup>5</sup> For an analysis on the importance of thinking both operationally in MOUT and focusing on centers of gravity, see Maj. Edward R. McCleskey (USAF), *Urban Warfare at the Operational Level: Identifying Centers of Gravity and Key Nodes*, (Maxwell AFB, Alabama: US Air Force Air University Air Command and Staff College, April 1999).

<sup>6</sup> Those grades were the product of two sources. One was a summary of the opinions and findings in the sources researched for this paper, and the other was the judgment of the Urban Operations Team at JAWP.

<sup>7</sup> Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities.



**Figure I-1. Mission – Operational Concept – Capability Relationship**

Of those nine missions, this document focuses primarily on what was perceived as the most difficult: CAPTURE AN URBAN AREA. The other eight missions are addressed but not in the same level of detail.

- ▶ Under the umbrella of the CAPTURE AN URBAN AREA mission, a list was drawn up of eight operational concepts that a JFC might use to accomplish the mission.
- ▶ Then each operational concept was analyzed for the capabilities (specific to the urban environment) needed to make it feasible.
- ▶ Once those needed capabilities were determined, each capability was graded relative to how well today's force fulfills the need.
- ▶ Finally, each of the capabilities was then also checked for sensitivity to a range of urban variables.

## C. Plan of This Document

Chapter II, "Operational Concepts," describes the operational concepts associated with the CAPTURE AN URBAN AREA mission. Page II-1.

Chapter III, "Needed Capabilities," lists all the needed capabilities derived from those operational concepts. This chapter also explains the method used to grade today's capabilities versus needed capabilities. Page III-1.

Chapter IV, "Urban Combat Variables," details a dozen key variables that would be encountered in the urban environment. Page IV-1.

Chapter V, “Patterns in Operational Concepts and Capabilities,” then takes the operational concepts and matches them with their respective needed capabilities. Observations are then made on what patterns and trends became evident from this breakout of capabilities. Page V–1.

Chapter VI, “Conclusions,” addresses the implications of these patterns and trends, followed by four appendixes, A through D, that provide more in-depth information. Page VI–1.

Appendix A, “Operational Concepts,” is an expanded version of the operational concepts–needed capabilities list from Chapter V, with the addition of variable sensitivity information. Page A–1.

Appendix B, “Summary of Needed Capabilities and Current Grades,” gives a detailed description of each capability’s grade. Page B–1.

Appendix C, “Summary of Urban Variable Impacts,” provides detailed information on the sensitivity of each capability to each of the variables introduced in Chapter IV. Page C–1.

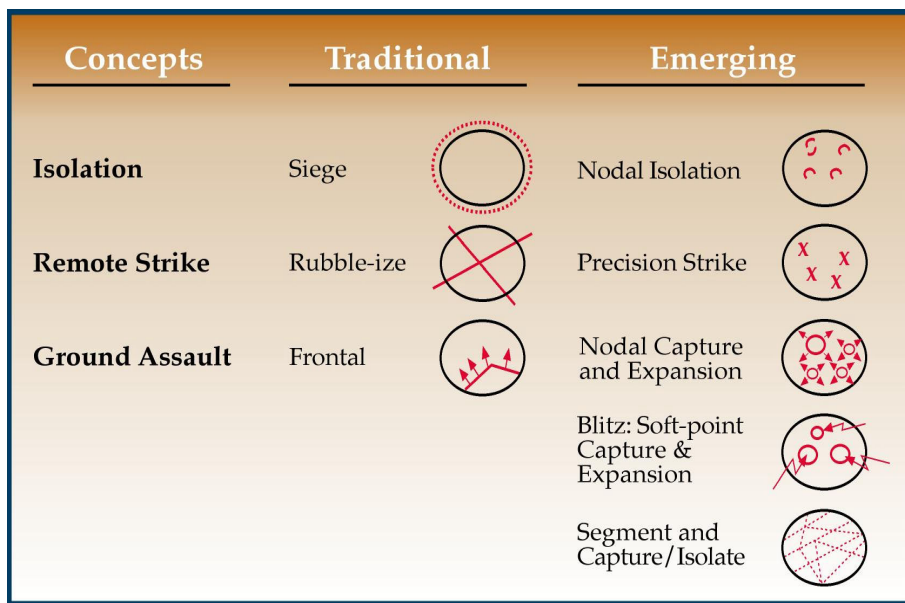
Appendix D, “Remaining Missions and Related Operational Concepts,” briefly examines possible operational concepts for use in the other eight missions, aside from the CAPTURE AN URBAN AREA mission. Page D–1.

Appendix E, “Relationship Between the Urban Roadmap and the Joint Warfighting Science and Technology Plan,” relates the implications for technology programs that follow from the above process to those that are given in the urban warfare section of the *OSD Joint Warfighting Science and Technology Plan*. Page E–1.

A bibliography and glossary (Appendices F and G, respectively) are presented at the end of this volume.

## II. Operational Concepts

The following notional operational concepts represent various approaches a JFC might use to accomplish the mission of capturing a city. (See Figure II–1 below.<sup>8</sup>) This particular mission was chosen for its difficulty (i.e., worst case scenario) and because it involves a very wide range of operational concepts and capabilities. The view was taken that if the CAPTURE AN URBAN AREA mission could be analyzed in depth, that analysis would also cover the preponderance of needs for the other eight missions.



**Figure II–1. Types of Operational Concepts (CAPTURE AN URBAN AREA)**

The operational concepts listed here bundle together tactical actions to achieve the JFC’s operational goal, CAPTURE AN URBAN AREA. The decision as to which to use, in what proportion, and in what sequence cannot be pre-scripted. Most missions would likely require the use of more than just one of the operational concepts. Those decisions will be up to the JFC after all the variables of the specific situation are evaluated.

The first three operational concepts (*Siege*, *Rubble-ize*, and *Frontal Assault*) represent the more traditional approaches, all three being well represented in history. They generally require less ISR, but often at the cost of more time, more forces, greater civilian casualties, and extensive damage to infrastructure. In the case of Frontal Assault, high Blue casualties are also likely. The remaining five operational concepts, the “Emerging” ones, all demand a much more detailed ISR picture of the city. But in exchange for that effort,

<sup>8</sup> From Volume I of this paper, repeated here for the convenience of the reader.

they offer the potential for lower Blue casualties, lower civilian casualties, and reduced damage to civilian infrastructure. More rapid completion of the mission and a reduced need for Blue forces (except for ISR assets) are two additional possible benefits.

## Traditional Operational Concepts

**Siege.** If time permits, this concept can dramatically lower Blue losses by keeping friendly forces out of the city. With the need to actually operate in the urban area obviated, the demands on force protection, mobility, engagement, and ISR capabilities would be much lower. The downsides are the large number of forces needed to seal off the city, the considerable amount of time needed for the siege to have its desired effect, and the heavy losses among civilians inside the city during the siege.<sup>9</sup>

**Rubble-ize.** This concept relies on standoff fires to attrite Red forces. While some of the munitions used would be precision guided, a substantial proportion would not be. The emphasis would be on firepower while concerns about collateral damage would be de-emphasized. To hasten its collapse, Red forces would also be cut off from outside sources of supply and reinforcement. In this operational concept, the demands on ISR would be less. Knowing the exact location of targets would not be as necessary when weapons with greater area effects are used. Knowing which window the sniper shot from is not essential if the entire building was going to be engaged. Another added benefit is lower Blue casualties because fewer Blue personnel are sent into the city itself. The downside is higher levels of both destruction to urban infrastructure and civilian casualties.<sup>10</sup>

**Frontal Assault.** This concept involves a linear sweep across the city. The location of Red forces would be determined by advancing until contact was made. Red forces would also be cut off from outside sources of supply and reinforcement. While requiring a less detailed ISR picture of the city, this concept would be very demanding on military resources. Large numbers of ground units, infantry especially, would be absorbed in manning a long frontline and clearing a large number of buildings. The time needed to secure the entire city would be considerable (weeks or months depending on the city). Other downsides are the high casualties among Blue personnel, civilian casualties, and extensive damage to infrastructure.

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<sup>9</sup> For an argument in favor of making siege, in combination with standoff strikes, the method of choice for the US military, see Major General Robert H. Scales, "The Indirect Approach," *Armed Forces Journal International* (October 1998): pp. 68–74.

<sup>10</sup> This operational concept was central to the second campaign in Chechnya by Russian forces. Anne Aldis, ed., *The Second Chechen War*, Occasional Paper No. 40 (Shrivenham, U.K.: Strategic and Combat Studies Institute, 2000): pp. 92–93. See also Timothy L. Thomas, and LtCol Lester W. Grau (USAF, ret.), "Russian Lessons Learned from the Battles for Grozny," *Marine Corps Gazette* (April 2000): pp. 45–48.



## Emerging Operational Concepts

**Nodal Isolation.** By limiting Red's use or access to certain critical nodes in the city, its ability to fight may be substantially degraded with a relatively limited use of military resources. The difficult task for ISR assets would be to find these nodes. A part of that equation would be knowing what Red needs and what it plans to need in the future. Once that is done, the isolation of those nodes could be accomplished with barrier technologies (physical or electromagnetic), and/or remote fires. Red forces would also be cut off from outside sources of supply and reinforcement.

**Precision Strike.** ISR systems would need to precisely identify Red force locations and nodes. By identifying targets (structures or Red units) that are key to Red, precision attacks could destroy a large percentage of Red's capability. Red forces would also be cut off from outside sources of supply and reinforcement. This operational concept would lower collateral damage, civilian casualties, friendly fire casualties, and the need for extensive Blue ground forces in the city and related logistical support.

**Nodal Capture and Expansion.** This concept would leverage control of critical nodes in the city to facilitate the capture of the rest of the city.<sup>11</sup> The ISR task would be a demanding one, requiring a knowledge of what constituted a node, where it was, and what would be the effect once the node was captured by Blue. The Blue force would then need the ability to rapidly capture those nodes while subsequently supporting any forces remaining there. Once Blue had control of these critical nodes, Blue forces would then expand out from these bridgeheads to finish off a weakened Red.<sup>12</sup> Red forces would also be cut off from outside sources of supply and reinforcement to prevent substitution for the support previously provided by the captured nodes.<sup>13</sup>

**Blitz: Soft-Point Capture and Expansion.** ISR systems would need to locate where Red forces were and were not. undefended areas would be captured and used by Blue as bridgeheads. This would likely require discontinuous operations and rapid maneuver.

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<sup>11</sup> These nodes could include power plants, historically important structures, local government administrative buildings, police facilities, bridges, key road junctions, train stations, radio stations, a building with good lines of sight, and military facilities. What denotes a key node will depend on what Blue needs, what Red needs, and what the civilian population needs, and those needs will be dynamic.

<sup>12</sup> This concept is generally similar to one laid out in a 1997 article by the Marine Corps Combat Development Command, LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," pp. A1–A6." In 1975 the North Vietnamese Army (NVA) used an approach similar to this. It would use HUMINT (human intelligence) networks to identify the urban transport nodes, the location of defending South Vietnamese forces, and their command and control nodes. The NVA would then have advance forces secure routes into the city so the command and control nodes could be attacked first. Then the NVA turned outward to finish off the weakened defenders in the rest of the city. LtCol. R. W. Lamont, "Urban Warrior—The View from North Vietnam," *Marine Corps Gazette* (April 1999): pp. 32–33.

<sup>13</sup> A Joint Staff publication on MOUT mentions the need to focus on "decisive points" upon which the enemy depends. US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations* (Washington, D.C.: US Government Printing Office, 2000): p. I–3.

From those bridgeheads Red could then be attacked from multiple directions. This “360-degree” threat would make movement, logistics, and force protection very difficult for Red. Red forces would also be cut off from outside sources of supply and reinforcement.

**Segment and Capture/Isolate.** The centerpiece of this concept is *counter-mobility*. By fixing in place Red forces, they lose the ability to mass for either defensive or offensive purposes. Red forces can then be defeated piecemeal. Segmenting the city also severely disrupts Red’s logistical operations. Central caches of arms and supplies, or critical nodes of the city’s infrastructure, can no longer support units in other parts of the city. In those sections of the city not containing Red forces, Blue efforts at reestablishing the indigenous support infrastructure (or bringing in outside support) can begin early. Red forces would also be cut off from outside sources of supply and reinforcement.

### III. Needed Capabilities

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The capabilities discussed in this section *do not* represent all of the capabilities that a JFC might use for the CAPTURE AN URBAN AREA mission. These capabilities enable a JFC to use the operational concepts previously listed. In this list, the focus is kept on those capabilities that are *urban specific*. Urban specific is defined as:

a capability that is only performed in built-up areas or one that is substantially different when performed in the urban environment.

A wide range of military capabilities common to both urban and non-urban environments is not addressed. Air superiority and general logistics capabilities (e.g., “feed the troops”) are examples that are not considered urban specific. *The goal is to focus on urban capabilities.* An exception is made in the case of wide-area target destruction because it is a central element in one of the operational concepts (*Rubble-ize*) and because of recent historical precedent (for example, the fighting in Grozny, Chechnya). Greater detail as to what each of these capabilities entails can be found in Appendix B of this volume.

The capabilities are separated and labeled according to the USECT scheme (Understand, Shape, Engage, Consolidate, and Transition).<sup>14</sup> Each capability was given a letter and number tag.

- ▶ The letter refers to the portion(s) of USECT the capability addresses.
- ▶ The number functions to simply differentiate between capabilities within each USECT component and has no relation to relative value

**Note:** Two of the capabilities (US4 and UST5) played strong roles in several areas. These capabilities have multiple letters in their designation that reflect the appropriate portions of USECT (i.e., US4 is used in place of a separate U4 and S4).

#### USECT scheme

##### UNDERSTAND

- U1 The ISR capability to **discern what is a node** (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.
- U2 The ISR ability to **locate and identify enemy forces**, including when they are in close proximity to friendly forces or intermixed with civilians.

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<sup>14</sup> The USECT scheme for looking at MOUT is taken from the second draft of Joint Publication 3-06, *Doctrine for Joint Urban Operations*, October 2000. These aspects of an operation may or may not occur sequentially. There is also considerable overlap in what each aspect addresses. In spite of the ambiguity this scheme of breaking down the various components of an operation is very useful. It allows one to group capabilities, based on what those capabilities are designed to achieve.

- U3 The ISR capability to **discern Red movement patterns, logistical methods, and intentions** for both.
- US4 The ability to **command, control, and communicate** with units operating in the urban environment where radio and GPS (Global Positioning System) systems work poorly.<sup>15</sup>
- UST5 The ability to **coordinate capabilities** across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.
- U6 The ISR capability to **generate an in-depth understanding of the city's population** and its likely future actions and/or reactions.
- U7 The ability to do **urban BDA** (Battle Damage Assessment).
- U8 The ISR ability to rapidly generate 3D, small-scale, up-to-date **digital maps of the urban battlespace** that include subterranean features and possibly building interiors.
- U9 Software and hardware **tools that allow for rehearsal and the assessment of courses of action**. These tools would use digital map information and updated intelligence information on Red, Blue, and White.
- U10 The ability to **detect and/or neutralize mines, booby traps, and toxic chemicals**.

#### SHAPE

- S1 The ability to **create barriers on the perimeter of the city** to prevent outside reinforcement and resupply of enemy forces.<sup>16</sup>
- S2 The ability to **maintain a secure front line** within the city to prevent enemy movement into cleared areas.
- S3 **Restrict Red's ability to react** via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.
- US4 The ability to **command, control, and communicate** with units operating in the urban environment where radio and GPS (Global Positioning System) systems work poorly.<sup>17</sup>
- UST5 The ability to **coordinate capabilities** across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.
- S6 **Intra-urban transport capability** (land and air) for moving forces, supplies, and wounded to isolated locations within a city.<sup>18</sup>
- S7 Conduct **resupply and casualty evacuations** on the "front line" for units operating in a contiguous fashion.

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<sup>15</sup> LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," p. A3.

<sup>16</sup> A 2000 MOUT study sponsored by the Army's TRADOC stated that isolating a city in the information age was for the most part impossible. Spiller, *Sharp Corners: Urban Operations at Century's End*, p. 98.

<sup>17</sup> LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," p. A3.

<sup>18</sup> A 1997 article on future MOUT concepts called the ability to move between isolated zones within the city critical. LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," p. A4.

- S8 Capabilities to communicate with, coordinate with, and **influence the local populace**.
- S9 The ability to **mislead Red as to the movement and location of Blue** forces in the city.
- S10 Conduct **small-unit combined arms operations**.<sup>19</sup>
- S11 **Medical capabilities to protect Blue personnel** from disease, psychological stress, and hazardous materials.
- S12 **Improved protection for dismounted personnel** from small arms, fragmentation, blast, and heat.
- S13 The ability to selectively **disable utility, transportation, and communication systems** in a city for the short or long term.<sup>20</sup>
- S14 **Improve infantry's mobility** over urban obstacles.

#### ENGAGE

- E1 The ability to **destroy wide area targets**.
- E2 The ability to **destroy point targets with minimal collateral damage**.
- E3 The ability to rapidly **clear buildings** with low Blue casualties and a minimum of Blue personnel.
- E4 Non-lethal capabilities for **dealing with crowds and Red**, both inside and outside of buildings.
- E5 **Sniper/counter-sniper capabilities**.
- E6 **Urban fire support**.

#### CONSOLIDATE

- C1 **Infrastructure management and repair** capabilities.
- C2 Capabilities to **reestablish the rule of law** in portions of the city under Blue control.
- C3 The capabilities to **mitigate the effects of WMD (weapons of mass destruction) use** on urban civilian populations and infrastructure.

#### TRANSITION

- UST5 The ability to **coordinate capabilities** across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.

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<sup>19</sup> A 1997 article by the Marine Corps Combat Development Command called for task organization to be pushed to the “very small unit-level” for MOUT. LtGen Paul K. Van Riper (USMC), “A Concept for Future Military Operations on Urbanized Terrain,” p. A5.

<sup>20</sup> “For the purposes of military conflict, establishing the capacity to manipulate an adversary’s power supply is infinitely superior merely to destroying it, for the simple reason that destruction does not offer the opportunity for control.” Spiller, *Sharp Corners: Urban Operations at Century’s End*, p. 104.

## Grade assignments

Each of the capabilities listed above is given a grade later in Appendix B. That grade reflects the JAWP urban operations team's evaluation of how fully today's currently fielded capabilities meet the needed level of capability. A more detailed explanation of each grade assignment can be found in Appendix B. The grades are as follows:

- ▶ **Good.** Today's level of capability can perform this task but with some room for improvement. That improvement may come in the form of an improvement in the desired effect's achievement level, reduced friendly casualties, and/or a reduced use of resources (i.e., manpower, logistics, equipment).
- ▶ **Fair.** Today's level of capability can perform this task but with serious limitations. Those limitations may come from some or all of the following three areas: the desired effect's achievement level, excessive friendly casualties, and excessive resource requirements (i.e., manpower, logistics, equipment).
- ▶ **Poor.** Today's level of capability cannot satisfactorily perform the task. That inability derives from some or all of the following: a low achievement level of the desired effect, excessive friendly casualties, and excessive resource requirements (i.e., manpower, logistics, equipment).

## IV. Urban Combat Variables

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Most capability performance levels are situation specific. The particulars of any given scenario will have varying degrees of effect on the capabilities available to a military commander.<sup>21</sup> While the totality of specifics cannot be prescribed for a military commander to plan against, those capabilities especially sensitive to particular variables can be foreseen. Knowing what those critical urban variables are beforehand can help the JFC ask the right questions at the right time. As often is the case today, the problem facing the military commander will not so much be a lack of information but a flood of information that obscures the really important data. In short, the goal is to focus the attention on those characteristics that will make or break the mission.

The following list<sup>22</sup> introduces the range of variables likely to have significant impact on MOUT. In Appendix A, a brief description of their impact on various capabilities and operational concepts can be found. Appendix C gives a detailed description of their impact on all 31 needed capabilities. In both appendices a simple low, medium, or high rating scale was used, high meaning that a capability was highly sensitive to a particular variable, while low and medium refer to decreasing sensitivity.

**Terrain/Climate/Weather.** The local terrain of a city can complicate operations by hindering flight operations, channelizing logistics and troop movements, and limiting the usefulness of certain weapon systems. Climate and weather conditions can limit flight operations.<sup>23</sup> Some climate and weather conditions can also pose major health risks to the local populace and raise casualty rates among Blue forces. WMD mitigation and cleanup are also impacted by weather.

**City size and physical type.** Larger cities can absorb very large numbers of troops. The wide range of city physical types, from shantytowns to hi-rise building clusters, requires a wide range of tactical and operational approaches.<sup>24</sup>

**Location of the City.** A city's location, vis-à-vis the continental United States, and overseas bases, or ocean approaches, will be a basic determinate in how fast US forces can deploy, logistical sustainability, and the ability of US air and sea power to strike targets in the city. The tremendous advantage in naval power that the United States has can swing from a minor to a dominating role, depending on the local geography. For example, the

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<sup>21</sup> The *Handbook for Joint Urban Operations* mentions four separate times the importance of recognizing the uniqueness of each city. US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, pp. EX-3, I-2, III-1, IV-34.

<sup>22</sup> This list is similar to one described in Volume I of this Roadmap.

<sup>23</sup> World War II operations in the Aleutian Islands of Alaska are a good example of this.

<sup>24</sup> "Long-standing ratios of urban time and space were to be turned on their head by the advent of public transportation systems." Spiller, *Sharp Corners: Urban Operations at Century's End*, p. 17.

US Navy's role in a conflict in Indonesia would be critical, while a conflict in Tajikistan would see a substantially reduced Navy role.

**Attitude of the populace.** The disposition of the populace—towards both the Red and Blue forces—is extremely important. A friendly populace can form the foundation of a HUMINT network. A hostile populace can do the same for the enemy. A hostile populace can require almost as much attention from the Blue military commander as the Red military force.<sup>25</sup>

**Local politics, culture, and history.** The politics, culture, and history of a city and its people will mold the mindset and attitudes of the civilians there. If reality is 90% perception, then “reality” in any given city will derive largely from its politics, culture, and history. Failure to understand these facets of a city's texture will make interaction with the populace a cascade of unintended consequences.

**Quality of joint, interagency, coalition, and/or NGO interaction.** Future urban fights will be joint, and most will be interagency, with coalition partners, and with NGOs. Therefore the quality of the cooperation—or lack therefore—from the various Services, agencies, nations, and/or NGOs participating will be an important determinate for mission success.<sup>26</sup> MOUT will demand a great deal of resources, and those resources are going to be spread across all the actors involved. If the JFC is cutoff from some of those actors, their attendant resources will also be cut off.

**ROE.** ROE will be crafted by the JFC in accordance with the general guidance given by the national command authorities. These rules can vary greatly from conflict to conflict and often change during a conflict. These rules are often a bigger limitation on military options than actual limitations in military capability.<sup>27</sup>

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<sup>25</sup> A 2000 MOUT study cited a city's morale as important as an army's morale. Spiller, *Sharp Corners: Urban Operations at Century's End*, p. 92.

<sup>26</sup> The US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations* lists coordination among all the actors important for success of urban operations in general (pp. EX-7, III-21, III-24); intelligence efforts (pp. III-10, IV-36); and working with the civilian population (p. III-14). OPERATION RESTORE HOPE in Somalia involved a 21-nation coalition and 30 NGOs (*Handbook*, IV-31).

The primary cause of the poor performance of Russian Federal forces in the first Chechen conflict (1994–1996) was a lack of coordination between the forces of the various agencies (Border Guards, Ministry of the Interior, and Ministry of Defense), according to Anne Aldis, *The Second Chechen War*, p. 50.

<sup>27</sup> For an article making a similar point, see Brig. Gen. John R. Groves (Kentucky National Guard), “Operations in Urban Environments,” *Military Review* (July–August 1998): pp. 31–40.

ROE will be a major factor in meeting fire support needs. For a look at this subject, see LtCol Travis M. Allen (USMC), *Protection Our Own: Fire Support in Urban Limited Warfare*. Carlisle Barracks, PA.: US Army War College. March 1999.

For two good examples of what a modern urban operation would look like with very unrestrictive ROE, one should look to the Russian military in Grozny in 1995 and again in 2000. In both cases there was little military capability (aside from WMD) that was held back. However, the destruction to the city and its inhabitants was substantial, substantial enough to incur Moscow significant political



**The overall theater campaign schedule.** The overall theater campaign may dictate a faster or slower tempo of operations against a particular city. Other objects in the theater may require the capture of a given city first, thus necessitating its rapid capture. Conversely, the need to take other objectives first may slow operations and siphon off resources (logistical, manpower, equipment) from the effort against a particular city. Another aspect of this variable could be whether US forces are already on location versus having to deploy from afar.

**Level of threat.** The level of threat coming from Red forces in the city will affect mission difficulty. A Red force in a city that has an effective standoff attack capability (e.g., Scuds with WMD) may necessitate a more rapid completion of the mission. Another factor is the ability of the Red force to threaten any Blue forces attacking into the city. A well-equipped Red force possessing, for example, high-quality MANPADS (Man-Portable Air Defense System) and/or anti-armor weapons could greatly reduce Blue operational and tactical options.

**Red political will.** Red force military actions will be based on political objectives. Those objectives will define the bounds of time allowed, forces allocated, acceptable losses, and acceptable political costs. It would greatly assist a JFC to know both what Red's political objectives were and the intensity of commitment to those goals. This variable focuses on the upper portions of the Red political and military chain of command.<sup>28</sup>

**Red force morale.** The willingness of the Red force to adhere to the wishes of its chain of command will largely depend on Red force morale. Weak morale at lower levels of the force can negate strong political will at the higher levels of command. Conversely, a Red force willing to press attacks forcefully and with little regard to losses can be a very dangerous foe. That level of will can make up for Red's weaknesses in equipment.<sup>29</sup>

**Blue political will.** Going into a conflict the US national command authorities are going to have in mind a cost-benefit calculus for the operation. That calculus will define the bounds of time allowed, forces allocated, acceptable losses, and acceptable domestic and/or international political costs.<sup>30</sup>

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costs vis-à-vis the West. That contrasts sharply with the United States being unwilling to allow armored vehicles to even deploy with its forces in Mogadishu in 1993.

<sup>28</sup> The NVA lost half of the 45,000 troops it sent into Hue in 1968 (US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, p. II-5). Stalin gave the Red Army only two weeks to capture Berlin, but allotted over 1.5 million troops for the effort (Stiller, *Sharp Corners: Urban Operations at Century's End*, p. 64.)

<sup>29</sup> "Underestimating the defender's abilities and determination, rather than failures to identify the defender's material strengths and location, were key errors at Ashrahiyeh [1978: Syria vs. Christian militia] and Zahle [1981: Syria vs. Lebanese Army]." US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element: Military Operations on Urban Terrain Manual*, p. 1-13.

<sup>30</sup> Six days after the loss of 18 US servicemen in Mogadishu, President Clinton announced the timetable for withdrawal of US forces. US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, p. IV-29.



## V. Patterns in Operational Concepts and Capabilities

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This chapter lists our estimates of which capabilities are needed for each operational concept. Following this list are two charts that summarize the capability demand for both traditional and the non-traditional operational concepts. Following those charts is a pattern analysis of both the operational concepts and needed capabilities.

USECT scheme (Understand, Shape, Engage, Consolidate, and Transition)

### A. Rubble-ize

- U2     ISR capability for locating Red forces
- S1     Barriers on the city's perimeter
- E1     Area target destruction

### B. Siege

- UST5   Coordination with joint, agency, coalition, and/or NGO actors
- S1     Barriers on the city's perimeter

### C. Frontal Assault

- US4     Urban command, control, and communications
- UST5   Coordination with joint, agency, coalition, and/or NGO actors
- U10     Detect and neutralize mine, booby trap, HAZMAT (Hazardous Material)
- S1     Barriers on the city's perimeter
- S2     Seal the "front line"
- S7     Conduct resupply and casualty evac while close to Red
- S8     Communicate with and influence civilians
- S10     Be able to do small-unit combined arms
- S11     Medical support for Blue vs. disease, stress, and/or HAZMAT
- S12     Improved body armor for dismounted infantry
- S14     Improved infantry mobility
- C1     Manage and repair the city's infrastructure
- C2     Reestablish the rule of law
- C3     Protect city's population and infrastructure from WMD
- E3     Clear buildings efficiently with low Blue casualties
- E5     Sniper and counter-sniper
- E6     Urban fire support

### D. Nodal Capture and Expansion

- U1     ISR capability for identifying nodes
- U2     ISR capability for locating Red forces

- U3 ISR for discerning Red movement, logistics, and intentions
- US4 Urban command, control, communications
- UST5 Coordination with joint, agency, and coalition and/or NGO actors
- U6 ISR for understanding local population
- U7 Urban BDA
- U8 3D digital maps of the city
- U9 Rehearsal and assessment tools
- U10 Detect and neutralize mine, booby trap, and HAZMAT
- S1 Barriers on the city's perimeter
- S2 Seal the "front line"
- S3 Restrict Red movement and fire capability
- S6 Intra-urban transport capability
- S7 Conduct resupply and casualty evac while close to Red
- S8 Communicate with and influence civilians
- S9 Mislead Red as to Blue movement and position
- S10 Be able to do small-unit combined arms
- S11 Medical support for Blue vs. disease, stress, and HAZMAT
- S12 Improved body armor for dismounted infantry
- S13 Disable city communications and utilities selectively
- S14 Improved infantry mobility
- C1 Manage and repair the city's infrastructure
- C2 Reestablish the rule of law
- C3 Protect city's population/infrastructure from WMD
- E2 Point target destruction with low collateral damage
- E3 Clear buildings efficiently with low Blue casualties
- E4 Non-lethals for Red or White, both inside and outside buildings
- E5 Sniper and counter-sniper
- E6 Urban fire support

## **E. Soft-Point Capture and Expansion**

- U2 ISR capability for locating Red forces
- U3 ISR for discerning Red movement logistics, and intentions
- US4 Urban command, control, and communications
- UST5 Coordination with joint, agency, coalition, and NGO actors
- U6 ISR for understanding local population
- U7 Urban BDA
- U8 3D digital maps of the city
- U9 Rehearsal and assessment tools
- U10 Detect and neutralize mine, booby trap, HAZMAT
- S1 Barriers on the city's perimeter

- S2 Seal the “front line”
- S3 Restrict Red movement and fire capability
- S6 Intra-urban transport capability
- S7 Conduct resupply and casualty evac while close to Red
- S8 Communicate with and influence civilians
- S9 Mislead Red as to Blue movement and position
- S10 Be able to do small-unit combined arms
- S11 Medical support for Blue vs. disease, stress, and/or HAZMAT
- S12 Improved body armor for dismounted infantry
- S13 Disable city communications and utilities selectively
- S14 Improved infantry mobility
- C1 Manage and repair the city’s infrastructure
- C2 Reestablish the rule of law
- C3 Protect city’s population and infrastructure from WMD
- E2 Point target destruction with low collateral damage
- E3 Clear buildings efficiently with low Blue casualties
- E4 Non-lethals for Red or White, both inside and outside buildings
- E5 Sniper and counter-sniper
- E6 Urban fire support

## **F. Segment and Capture/Isolate**

- U2 ISR capability for locating Red forces
- U3 ISR for discerning Red movement, logistics, and intentions
- US4 Urban command, control, and communications
- UST5 Coordination with joint, agency, coalition, and NGO actors
- U6 ISR for understanding local population
- U7 Urban BDA
- U8 3D digital maps of the city
- U9 Rehearsal and assessment tools
- U10 Detect and neutralize mine, booby trap, and HAZMAT
- S1 Barriers on the city’s perimeter
- S2 Seal the “front line”
- S3 Restrict Red movement and fire capability
- S7 Conduct resupply and casualty evac while close to Red
- S8 Communicate with and influence civilians
- S9 Mislead Red as to Blue movement and position
- S10 Be able to do small-unit combined arms
- S11 Medical support for Blue vs. disease, stress, and/or HAZMAT
- S12 Improved body armor for dismounted infantry
- S13 Disable city communications and utilities selectively

- S14 Improved infantry mobility
- C1 Manage and repair the city's infrastructure
- C2 Reestablish the rule of law
- C3 Protect city's population and infrastructure from WMD
- E2 Point target destruction with low collateral damage
- E3 Clear buildings efficiently with low Blue casualties
- E4 Non-lethal weaponry for Red or White, both inside and outside buildings
- E5 Sniper and counter-sniper
- E6 Urban fire support

## **G. Precision Strike**

- U1 ISR capability for identifying nodes
- U2 ISR capability for locating Red forces
- U3 ISR for discerning Red movement, logistics, and intentions
- UST5 Coordination with joint, agency, coalition, and NGO actors
- U7 Urban BDA
- U8 3D digital maps of the city
- U9 Rehearsal and assessment tools
- S1 Barriers on the city's perimeter
- S13 Disable city communications and utilities selectively
- E2 Point target destruction with low collateral damage

## **H. Nodal Isolation**

- U1 ISR capability for identifying nodes
- U3 ISR for discerning Red movement, logistics, and intentions
- UST5 Coordination with joint, agency, coalition, and NGO actors
- U6 ISR for understanding local population
- U7 Urban BDA
- U8 3D digital maps of the city
- S1 Barriers on the city's perimeter
- S3 Restrict Red movement and fire capability
- S8 Communicate with and influence civilians
- S13 Disable city communications and utilities selectively
- E2 Point target destruction with low collateral damage
- E4 Non-lethals for Red or White, both inside and outside buildings.

## I. The Patterns in Operational Concepts and Capabilities

Four patterns have emerged as the result of our analysis of both the operational concepts and needed capabilities:

- ▶ Non-traditional operational concepts have much longer lists of needed capabilities, with most of that growth relating to Understand and Shape.
- ▶ Operational concepts that require inserting forces into the city also require longer lists of capabilities, with most of that growth relating to Understand and Shape.
- ▶ Of all the elements of USECT, today's capabilities are the least proficient in the USECT component Understand.
- ▶ Improvements in non-lethal weapons would address many of the current weaknesses in the Shape, Engage, and Consolidate components.

Each pattern is discussed in more detail in the following sections.

### 1. Non-traditional operational concepts have much longer lists of needed capabilities

The first pattern relates to overall demand for capabilities between traditional and non-traditional operational concepts. The first three traditional operational concepts (Siege, Rubble-ize, Frontal Assault) generally require far fewer capabilities than the non-traditional concepts now emerging. This requirement for a more narrow range of competencies is a reflection of traditional, simpler approach to MOUT. They tend to focus on imparting one major effect on Red. For example: *Siege* focuses on logistical strangulation. *Rubble-ize* uses extensive firepower directly against Red's forces.<sup>31</sup> *Frontal Assault* takes away real estate from Red by way of a methodical sweep across the city.

Conversely, the non-traditional operational concepts ("emerging") require a broader range of capabilities:

- ▶ While Frontal Assault requires 17 capabilities, Nodal Capture and Expansion requires 30 (out of a total list of 31). Most of this increase in demand is fueled by the needs of Understand and Shape. The traditional operational concepts do not have the same need to understand Red, White, or the city itself, and so they can leave off many ISR-related capabilities.
- ▶ Of 10 total Understand capabilities, the traditional operational concepts require only 4, while the non-traditional concepts called for all 10.

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<sup>31</sup> A 2000 study of MOUT directed by TRADOC stated of military commanders, "If he attempts to accomplish the urban mission by combat power alone, he will likely fail. Too often in conventional operations in the past, combat power—and even more specifically, firepower—has been made to compensate for shortcomings in strategic or operational vision." Spiller, *Sharp Corners: Urban Operations at Century's End*, p. 107.

- ▶ In their efforts to hit Red with multiple effects in a rapid fashion, the non-traditional concepts called for all 12 of the Shape capabilities while the traditional concepts only required 8.

Conversely, the non-traditional operational concepts require a broader range of capabilities:

- ▶ While Frontal Assault requires 17 capabilities, Nodal Capture and Expansion requires 30 (out of a total list of 31). Most of this increase in demand is fueled by the needs of Understand and Shape. The traditional operational concepts do not have the same need to understand Red, White, or the city itself, and so they can leave off many ISR-related capabilities.
- ▶ Of the 10 total Understand capabilities, the traditional operational concepts require only 10, while the non-traditional concepts called for all 10.
- ▶ In their efforts to hit Red with multiple effects in a rapid fashion, the non-traditional concepts called for all 12 of the Shape capabilities while the traditional concepts only required eight.

This trend in heavy ISR demand is also illustrated in Figure V-1 (on the following page).

- ▶ The top chart displays the capability demand by the five non-traditional operational concepts. The highest demand level is for Understand capabilities.
- ▶ Conversely, the bottom chart shows the lighter demand for Understand and Shape capabilities by the traditional operational concepts.
- ▶ Of the 12 capabilities not called for by any of the traditional concepts, 10 relate to Understand and Shape.

## **2. Operational concepts that require inserting forces into the city also require longer lists of capabilities**

A second pattern, one that crosses traditional and non-traditional boundaries, relates to the use of substantial ground forces inside the city. Those operational concepts that require placing forces in the city involve much longer lists of capabilities.

- ▶ Of the traditional concepts, only Frontal Assault has more than a few needed capabilities.
- ▶ Of the non-traditional concepts, the number of needed capabilities ranges between 28 to 30, except for the two concepts that do not require inserting forces into the city.
- ▶ Precision Strike and Nodal Isolation require only 10 and 12 capabilities, respectively.



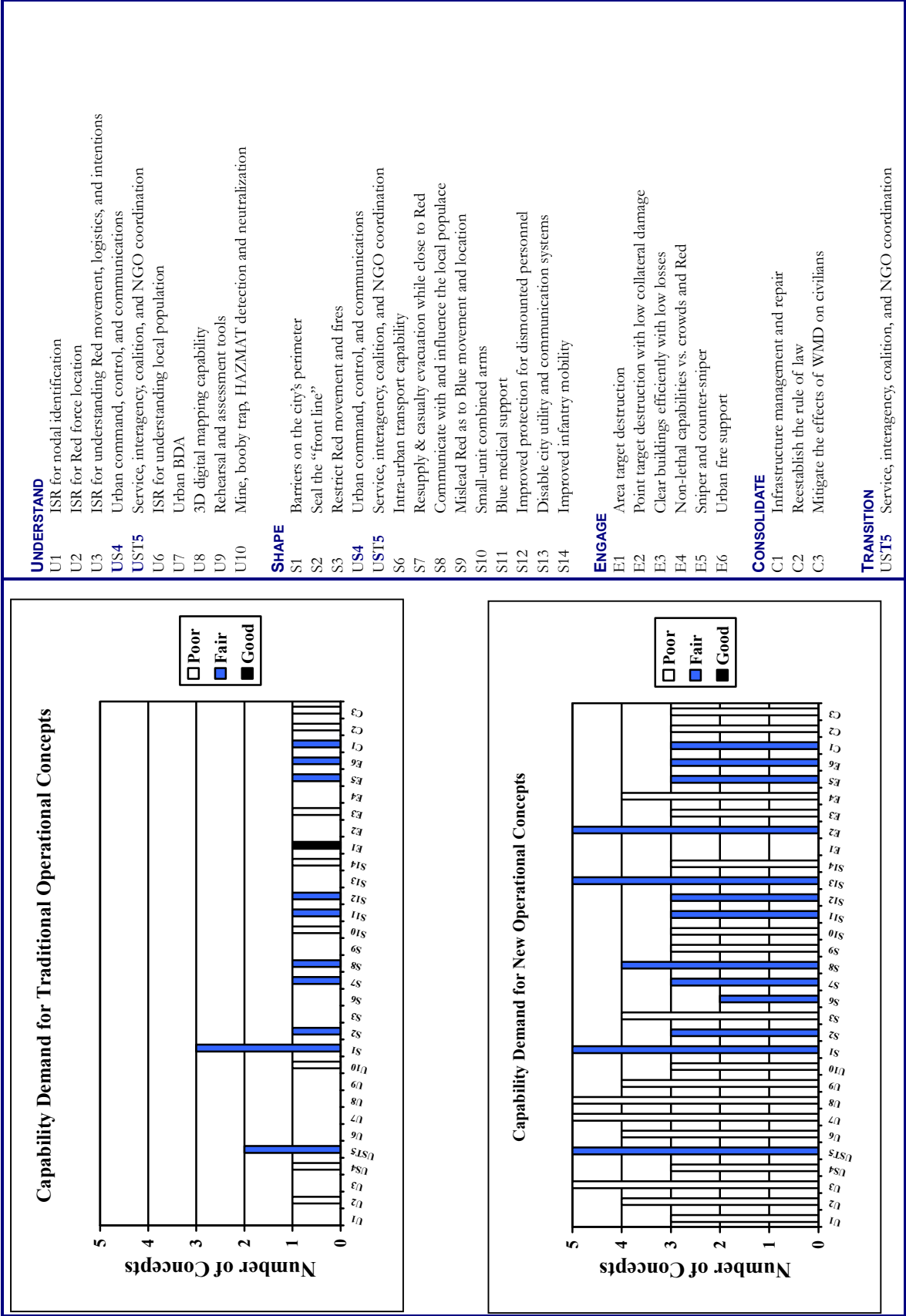


Figure V-1. Capability Demands for Traditional and New Operational Concepts

### 3. Today's capabilities are the least proficient in the USECT component Understand

A third pattern is the grade trend across USECT for the overall list of 31 capabilities (see Figure V-1 on the previous page).

- ▶ The Understand category clearly receives grades that are worse than the other categories, with 9 of the 10 capabilities receiving grades of poor.
- ▶ Given that the grades are designed to show the gap between today's capabilities and needed capabilities for new MOUT operational concepts, it would appear that today's greatest weakness in MOUT derives from ISR and the ability to understand the urban environment. When this deficiency is combined with the heavy emphasis of the non-traditional operational concepts on Understand, it points to ISR as the biggest obstacle to a new approach to MOUT. In short, the capabilities that generate understanding in MOUT are low-density – high-demand.

### 4. Improvements in non-lethal weapons would address many of the current weaknesses in the Shape, Engage, and Consolidate components

A fourth pattern of note relates to those capabilities under Shape, Engage, and Consolidate with grades of “poor.” Any capability, no matter how effective against Red, that has the undesirable side effect of indiscriminately killing civilians is of dubious value in MOUT. Of the eight that fall into that category, four could benefit significantly from improved non-lethal weapons.

- ▶ **S3.** The restricting of Red movement and fires could benefit from non-lethal barrier improvements. Barriers could be erected to slow or stop Red movement without endangering civilians who might encounter those barriers.
- ▶ **E3.** The clearing of buildings could be done with less risk to Blue personnel and civilians inside at the time. Non-lethal weapons would allow more “just in case” engagement inside structures.
- ▶ **E4.** Crowds could be dealt with more effectively, safely, and quickly while denying their utility as shields to Red.
- ▶ **C2.** The reestablishment of law and order could be done with less chance of instilling hostility in the local population.<sup>32</sup>

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<sup>32</sup> Recent events in Israel are a case in point.

## VI. Conclusions

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### A. Traditional vs. Emerging Operational Capabilities

One of the purposes of this document was to explore traditional and non-traditional operational concepts for MOUT. Much like operations in World War II differed greatly from those of World War I, these new operational concepts aim to replace slow-paced attrition with decisive and informed maneuver. However, the price demanded is a wide range of new capabilities, especially in the areas of ISR and shaping.<sup>33</sup> This is particularly true of the new operational concepts that insert forces directly into the city. The two non-traditional operational concepts that do not insert forces into the city (Precision Strike, Nodal Isolation) also demand significantly improved capabilities for understanding in an urban environment, but they do not require the additional capabilities associated with the insertion of ground forces.

**Potential benefits.** The potential benefits of urban operational concepts based on understanding, shaping and precision engagement are considerable:

- ▶ The need to man a long continuous front line, or clear every building, or close with every Red unit, or wait for months in siege, would be greatly reduced.
- ▶ Red will be forced to deal with numerous threats from several directions and nearly simultaneously.
- ▶ Locations in the city of value to Red would be discovered and taken by forces that can move anywhere in the city rapidly and remain there. This presents Red with a 360-degree threat.
- ▶ Use of the city's utility, transportation, and communication infrastructures will be denied to Red because Blue can turn them on and off at will, without causing long-term damage.
- ▶ Red's ability to move and fire will be hindered by new barrier technologies, interference in Red command, control, and communications, Information Operations/Electronic Warfare (IO/EW) operations to hinder Red ISR, and a better understanding of Red's plans and goals.
- ▶ The synergy of effects impacting Red would rapidly reduce its ability to fight.<sup>34</sup>

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<sup>33</sup> "The employment of cybernetic and other special, national-level assets can begin to shape the situation even before actual forces have begun to move. In the best possible case, then, the closure of friendly troops on the objective would mark the *consummation* of strategic success, not the commencement of struggle toward it." Spiller, *Sharp Corners: Urban Operations at Century's End*, p. 119.

<sup>34</sup> "In future MOUT, Marines will leverage the peculiarities of the urban environment to develop and maintain tempo, thereby creating a cascading, deteriorating effect upon the enemy." LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," p. A2.

- ▶ The same mission of CAPTURE AN URBAN AREA might be accomplished with fewer forces (except for ISR assets), less collateral damage, fewer civilian casualties, fewer Blue casualties, and/or in less time than the more traditional approaches.

## B. Needed Capabilities for MOUT

The second purpose of this document was to create a list of needed capabilities for MOUT. Possessing that toolbox of capabilities would enable a JFC to conduct a range of new operational concepts, with the potential to revolutionize MOUT. A part of that analysis was to look for capabilities that were both in high demand across many of the operational concepts, but performing poorly. Urban ISR qualified under both. That would suggest that future MOUT operational concepts will require some form of major improvement in the US military's ability to understand the urban environment. To that end, a heavy emphasis should be put on improving those capabilities.

Today's ability to shape the urban environment is also well short of what is needed for the newer operational concepts. While the gap between supply and demand is not as great as with the Understand component, the broad range of needed capabilities presents quite a challenge. Of the shaping capabilities, those aimed at standoff shaping are both the most difficult to achieve but offer the greatest potential benefits. Robotics and information technology offer great promise in both this area and ISR.

Attaining the range of ISR capabilities called for in the non-traditional operational concepts will be difficult. The current generation of line-of-sight (LOS) sensors may need replacement by non-line-of-sight (NLOS) systems, or to be networked. The effort toward improving both ISR and shaping capabilities should address a full range of DOTMLPF solutions. The solutions would involve much more than simply plugging in some new system or technology into pre-existing structures.<sup>35</sup> Every aspect of MOUT would need review.

Throughout history this country's military has tackled a long list of very difficult problems. Amphibious warfare, carrier operations, strategic bombing, mechanized warfare, and combined arms operations were all very difficult. However, they all proved revolutionary in their impact on the battlefield. Someday MOUT will be added to that list.

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<sup>35</sup> LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," p. A6.

# **Appendix A. Operational Concepts and Needed Capabilities**

Operational Concept: Siege .....	A-3
Operational Concept: Rubble-ize .....	A-4
Operational Concept: Frontal Assault .....	A-5
Operational Concept: Nodal Isolation.....	A-8
Operational Concept: Precision Strike.....	A-10
Operational Concept: Nodal Capture and Expansion .....	A-12
Operational Concept: Soft-Point Capture and Expansion .....	A-17
Operational Concept: Segment and Capture/Isolate .....	A-22

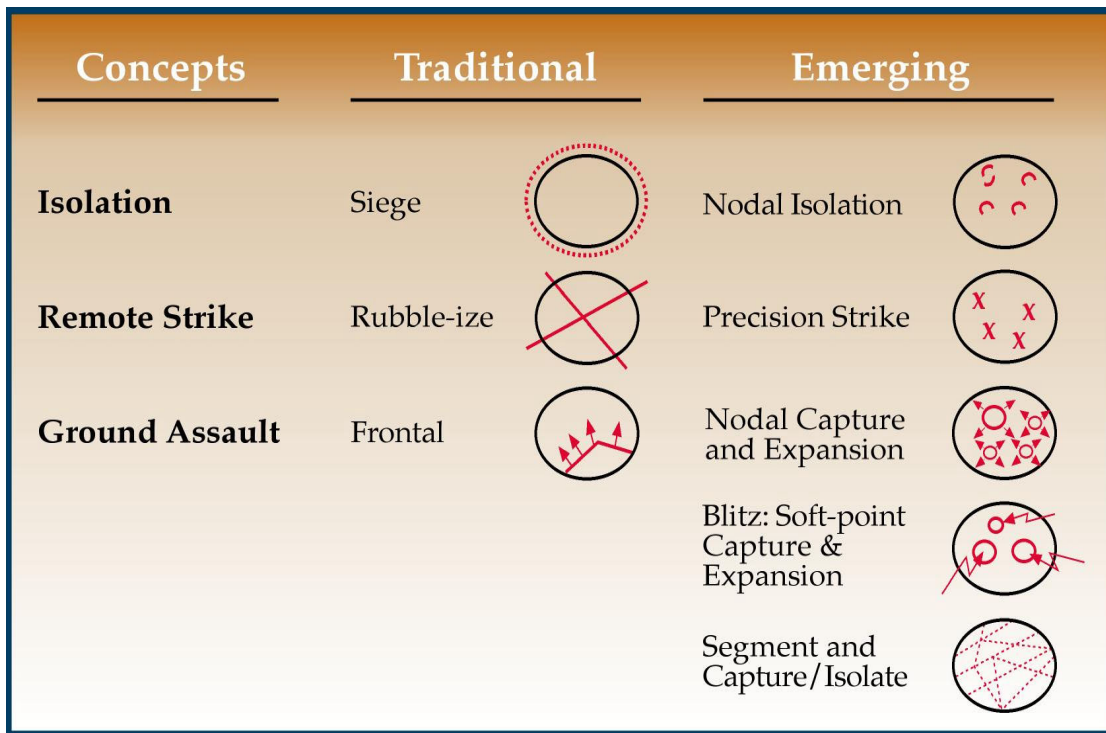


Figure A-1. Types of Operational Concepts (Capture an Urban Area)

## Operational Concept: Siege

### Needed Capabilities

<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries.
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>S1</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/Interagency/Coalition Interaction ROE Level of Threat

## Operational Concept: Rubble-ize

### Needed Capabilities

<b>U2</b>	The ISR ability to locate and identify Red forces in the city, including when they are in close proximity to friendly forces or intermixed with civilians.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Joint/Interagency/Coalition Interaction Theater Campaign Schedule
<b>S1</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces. Urban rubble can still provide good cover for enemy forces, provided that fresh troops can replace those lost in the buildings when the buildings were initially attacked.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/Interagency/Coalition Interaction ROE Level of Threat
<b>E1</b>	The ability to destroy wide area targets. Red forces may choose to operate in a dispersed fashion to deny lucrative targets for PGMs. Given sufficiently generous ROE, the ability to attack wide areas could provide an effective counter to that tactic.
<b>Grade</b>	Good
<b>Key Variables</b>	ROE Blue Political Will



## Operational Concept: Frontal Assault

### Needed Capabilities

<b>US4</b>	The ability to command, control and communicate with units operating in the urban environment where radio and GPS systems work poorly.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>U10</b>	The ability to detect/neutralize mines, booby traps, and toxic chemicals.
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>SI</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/Interagency/Coalition Interaction ROE Level of Threat
<b>S2</b>	The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Blue Political Will
<b>S7</b>	Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion
<b>Grade</b>	Fair
<b>Key Variables</b>	Level of Threat

<b>S8</b>	Capabilities to communicate with, coordinate with, and influence the local populace
<b>Grade</b>	Fair
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>S10</b>	Conduct small unit combined arms operations
<b>Grade</b>	Poor
<b>Key Variables</b>	Joint/Interagency/Coalition Interaction
<b>S11</b>	Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Location of the City
<b>S12</b>	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>S14</b>	Improve infantry's mobility over urban obstacles
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>E3</b>	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type ROE Red Political Will Red Force Morale Blue Political Will
<b>E5</b>	Sniper/Counter-Sniper capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Attitude of the Populace
<b>E6</b>	Urban fire support
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type ROE

<b>C1</b>	Infrastructure management and repair capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction Red Political Will
<b>C2</b>	Capabilities to reestablish the rule of law in portions of the city under Blue control
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Local Politics/Culture/History
<b>C3</b>	The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure
<b>Grade</b>	Poor
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Joint/Interagency/Coalition Interaction Theater Campaign Schedule

## Operational Concept: Nodal Isolation

### Needed Capabilities

<b>U1</b>	The ISR capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military and geographic.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>U3</b>	The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries.
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>U6</b>	The ISR capability to generate an in-depth understanding of the city's population and its likely future actions/reactions.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>U7</b>	The ability to do urban BDA.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat
<b>U8</b>	The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat

<b>S3</b>	Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction ROE Theater Campaign Schedule Level of Threat Blue Political Will
<b>S8</b>	Capabilities to communicate with, coordinate with, and influence the local populace
<b>Grade</b>	Fair
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>S13</b>	The ability to selectively disable utility, transportation and communication systems in a city for the short- or long-term. Not having access to these systems would make it more difficult for the Red force to sustain itself and conduct command and control.
<b>Grade</b>	Fair
<b>Key Variables</b>	ROE
<b>E2</b>	The ability to destroy point targets with minimal collateral damage.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather
<b>E4</b>	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.
<b>Grade</b>	Poor
<b>Key Variables</b>	ROE

## Operational Concept: Precision Strike

### Needed Capabilities

<b>U1</b>	The ISR capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military and geographic.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>U2</b>	The ISR ability to locate and identify enemy forces, including when they are in close proximity to friendly forces or intermixed with civilians.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Joint/Interagency/Coalition Interaction Theater Campaign Schedule
<b>U3</b>	The ISR capability to discern Red movement patterns, logistical methods, and intentions for both. This will highlight lucrative targets for precision strike.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries.
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>U7</b>	The ability to do urban BDA.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat

<b>U8</b>	The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat
<b>U9</b>	Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red/Blue/White.
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>S1</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces. Absent isolation enemy forces will be able to replace forces and supplies lost to precision strike.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/interagency/Coalition Interaction ROE Level of Threat
<b>S13</b>	The ability to selectively disable utility, transportation and communication systems in a city for the short- or long-term.
<b>Grade</b>	Fair
<b>Key Variables</b>	ROE
<b>E2</b>	The ability to destroy point targets with minimal collateral damage.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather

## Operational Concept: Nodal Capture and Expansion

### Needed Capabilities

<b>U1</b>	The ISR capability to discern what is a node along with which ones the enemy holds. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military and geographic
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>U2</b>	The ISR ability to locate and identify enemy forces, including when they are in close proximity to friendly forces or intermixed with civilians
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Joint/Interagency/Coalition Interaction Theater Campaign Schedule
<b>U3</b>	The ISR capability to discern Red movement patterns, logistical methods, and intentions for both
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>US4</b>	The ability to command, control and communicate with units operating in the urban environment where radio and GPS systems work poorly
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>U6</b>	The ISR capability to generate an in-depth understanding of the city's population and its likely future actions/reactions
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction



<b>U7</b>	The ability to do urban BDA
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat
<b>U8</b>	The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat
<b>U9</b>	Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red/Blue/White
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>U10</b>	The ability to detect/neutralize mines, booby traps, and toxic chemicals
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>S1</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/Interagency/Coalition Interaction ROE Level of Threat
<b>S2</b>	The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Blue Political Will

<b>S3</b>	Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction ROE Theater Campaign Schedule Level of Threat Blue Political Will
<b>S6</b>	Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city
<b>Grade</b>	Fair
<b>Key Variables</b>	Level of Threat Red Force Morale
<b>S7</b>	Conduct resupply and casualty evacuations on the "front line" for units operating in a contiguous fashion
<b>Grade</b>	Fair
<b>Key Variables</b>	Level of Threat
<b>S8</b>	Capabilities to communicate with, coordinate with, and influence the local populace
<b>Grade</b>	Fair
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>S9</b>	The ability to mislead Red as to the movement and location of Blue forces in the city.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace
<b>S10</b>	Conduct small unit combined arms operations
<b>Grade</b>	Poor
<b>Key Variables</b>	Joint/Interagency/Coalition Interaction

<b>S11</b>	Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Location of the City
<b>S12</b>	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>S13</b>	The ability to selectively disable utility, transportation and communication systems in a city for the short- or long-term. Not having access to these systems would make it more difficult for the Red force to sustain itself and conduct command and control
<b>Grade</b>	Fair
<b>Key Variables</b>	ROE
<b>S14</b>	Improve infantry's mobility over urban obstacles
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>E2</b>	The ability to destroy point targets with minimal collateral damage.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather
<b>E3</b>	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type ROE Red Political Will Red Force Morale Blue Political Will
<b>E4</b>	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings
<b>Grade</b>	Poor
<b>Key Variables</b>	ROE

<b>E5</b>	Sniper/Counter-Sniper capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Attitude of the Populace
<b>E6</b>	Urban fire support
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type ROE
<b>C1</b>	Infrastructure management and repair capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction Red Political Will
<b>C2</b>	Capabilities to reestablish the rule of law in portions of the city under Blue control
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Local Politics/Culture/History
<b>C3</b>	The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure
<b>Grade</b>	Poor
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Joint/Interagency/Coalition Interaction Theater Campaign Schedule

## Operational Concept: Soft-Point Capture & Expansion

### Needed Capabilities

<b>U2</b>	The ISR ability to locate and identify enemy forces, including when they are in close proximity to friendly forces or intermixed with civilians
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Joint/Interagency/Coalition Interaction Theater Campaign Schedule
<b>U3</b>	The ISR capability to discern Red movement patterns, logistical methods, and intentions for both
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>US4</b>	The ability to command, control and communicate with units operating in the urban environment where radio and GPS systems work poorly
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>U6</b>	The ISR capability to generate an in-depth understanding of the city's population and its likely future actions/reactions
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>U7</b>	The ability to do urban BDA
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat

<b>U8</b>	The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat
<b>U9</b>	Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red/Blue/White.
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>U10</b>	The ability to detect/neutralize mines, booby traps, and toxic chemicals
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>S1</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/interagency/Coalition Interaction ROE Level of Threat
<b>S2</b>	The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Blue Political Will

<b>S3</b>	Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction ROE Theater Campaign Schedule Level of Threat Blue Political Will
<b>S6</b>	Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city
<b>Grade</b>	Fair
<b>Key Variables</b>	Level of Threat Red Force Morale
<b>S7</b>	Conduct resupply and casualty evacuations on the "front line" for units operating in a contiguous fashion
<b>Grade</b>	Fair
<b>Key Variables</b>	Level of Threat
<b>S8</b>	Capabilities to communicate with, coordinate with, and influence the local populace
<b>Grade</b>	Fair
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>S9</b>	The ability to mislead Red as to the movement and location of Blue forces in the city.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace
<b>S10</b>	Conduct small unit combined arms operations
<b>Grade</b>	Poor
<b>Key Variables</b>	Joint/Interagency/Coalition Interaction
<b>S11</b>	Medical capabilities to protect blue personnel from disease, psychological threats, and hazardous materials
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Location of the City

<b>S12</b>	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>S13</b>	The ability to selectively disable utility, transportation and communication systems in a city for the short- or long-term. Not having access to these systems would make it more difficult for the Red force to sustain itself and conduct command and control
<b>Grade</b>	Fair
<b>Key Variables</b>	ROE
<b>S14</b>	Improve infantry's mobility over urban obstacles
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>E2</b>	The ability to destroy point targets with minimal collateral damage
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather
<b>E3</b>	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type ROE Red Political Will Red Force Morale Blue Political Will
<b>E4</b>	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings
<b>Grade</b>	Poor
<b>Key Variables</b>	ROE
<b>E5</b>	Sniper/Counter-Sniper capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Attitude of the Populace
<b>E6</b>	Urban fire support
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type ROE



<b>C1</b>	Infrastructure management and repair capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction Red Political Will
<b>C2</b>	Capabilities to reestablish the rule of law in portions of the city under Blue control
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Local Politics/Culture/History
<b>C3</b>	The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure
<b>Grade</b>	Poor
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Joint/Interagency/Coalition Interaction Theater Campaign Schedule

## Operational Concept: Segment and Capture/Isolate Needed Capabilities

<b>U2</b>	The ISR ability to locate and identify enemy forces, including when they are in close proximity to friendly forces or intermixed with civilians
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Joint/Interagency/Coalition Interaction Theater Campaign Schedule
<b>U3</b>	The ISR capability to discern Red movement patterns, logistical methods, and intentions for both
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>US4</b>	The ability to command, control and communicate with units operating in the urban environment where radio and GPS systems work poorly
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>UST5</b>	Coordination capabilities across service, agency, coalition partner, and NGO boundaries
<b>Grade</b>	Fair
<b>Key Variables</b>	—
<b>U6</b>	The ISR capability to generate an in-depth understanding of the city's population and its likely future actions/reactions
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace Joint/Interagency/Coalition Interaction
<b>U7</b>	The ability to do urban BDA
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat

<b>U8</b>	The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Theater Campaign Schedule Level of Threat
<b>U9</b>	Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red/Blue/White.
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>U10</b>	The ability to detect/neutralize mines, booby traps, and toxic chemicals.
<b>Grade</b>	Poor
<b>Key Variables</b>	—
<b>S1</b>	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Location of the City Joint/interagency/Coalition Interaction ROE Level of Threat
<b>S2</b>	The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas.
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Blue Political Will

<b>S3</b>	Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction ROE Theater Campaign Schedule Level of Threat Blue Political Will
<b>S7</b>	Conduct resupply and casualty evacuations on the "front line" for units operating in a contiguous fashion.
<b>Grade</b>	Fair
<b>Key Variables</b>	Level of Threat
<b>S8</b>	Capabilities to communicate with, coordinate with, and influence the local populace.
<b>Grade</b>	Fair
<b>Key Variables</b>	Attitude of the Populace Local Politics/Culture/History Joint/Interagency/Coalition Interaction
<b>S9</b>	The ability to mislead Red as to the movement and location of Blue forces in the city.
<b>Grade</b>	Poor
<b>Key Variables</b>	Attitude of the Populace
<b>S10</b>	Conduct small unit combined arms operations.
<b>Grade</b>	Poor
<b>Key Variables</b>	Joint/Interagency/Coalition Interaction
<b>S11</b>	Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials.
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Location of the City
<b>S12</b>	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.
<b>Grade</b>	Fair
<b>Key Variables</b>	—

<b>S13</b>	The ability to selectively disable utility, transportation and communication systems in a city for the short- or long-term. Not having access to these systems would make it more difficult for the Red force to sustain itself and conduct command and control.
<b>Grade</b>	Fair
<b>Key Variables</b>	ROE
<b>S14</b>	Improve infantry's mobility over urban obstacles.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type
<b>E2</b>	The ability to destroy point targets with minimal collateral damage.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather
<b>E3</b>	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type ROE Red Political Will Red Force Morale Blue Political Will
<b>E4</b>	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.
<b>Grade</b>	Poor
<b>Key Variables</b>	ROE
<b>E5</b>	Sniper/Counter-Sniper capabilities.
<b>Grade</b>	Fair
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Attitude of the Populace
<b>E6</b>	Urban fire support
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type ROE
<b>C1</b>	Infrastructure management and repair capabilities
<b>Grade</b>	Fair
<b>Key Variables</b>	City Size and Type Joint/Interagency/Coalition Interaction Red Political Will

<b>C2</b>	Capabilities to reestablish the rule of law in portions of the city under Blue control.
<b>Grade</b>	Poor
<b>Key Variables</b>	City Size and Type Attitude of the Populace Local Politics/Culture/History
<b>C3</b>	The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure.
<b>Grade</b>	Poor
<b>Key Variables</b>	Terrain/Climate/Weather City Size and Type Joint/Interagency/Coalition Interaction Theater Campaign Schedule

## **Appendix B. Summary of Needed Capabilities and Current Grades**





## Contents

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Grade Summary .....	7
Understand .....	9
U1     The intelligence, surveillance, and reconnaissance (ISR) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.....	9
Grade: Poor.....	9
U2     The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.....	10
Grade: Poor.....	10
U3     The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.....	11
Grade: Poor.....	11
US4    The ability to command, control, and communicate with units operating in the urban environment where radio and GPS systems work poorly.....	12
Grade: Poor.....	12
UST5   Coordination capabilities across Service, agency, coalition partner, and NGO boundaries.....	13
U6     The ISR capability to generate an in-depth understanding of the city's population and its likely future actions and reactions. ....	14
Grade: Poor.....	14
U7     The ability to do urban BDA (Battle Damage Assessment).....	15
U8     The ISR ability to rapidly generate 3D, small-scale, up-to-date digital maps of the urban battlespace that include subterranean features and possibly building interiors.....	16
Grade: Poor.....	16
U9     Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces.....	16
Grade: Poor.....	16
U10    The ability to detect and neutralize mines, booby traps, and toxic chemicals.....	17
Grade: Poor.....	17
Shape .....	18
S1     The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.....	18

	Grade: Fair .....	18
S2	The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas. ....	18
	Grade: Fair .....	18
S3	Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire; restricting the ability to command and control movement and fires; and restricting the inflow of information Red needs to make decisions on movement and fires. ....	19
	Grade: Poor.....	19
S6	Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.....	20
	Grade: Fair .....	20
S7	Conduct resupply and casualty evacuations on the "front line" for units operating in a contiguous fashion.....	22
	Grade: Fair .....	22
S8	Capabilities to communicate with, coordinate with, and influence the local populace.....	22
	Grade: Fair .....	22
S9	The ability to mislead Red as to the movement and location of Blue forces in the city. ....	23
	Grade: Poor.....	23
S10	Conduct small-unit combined arms operations.....	24
	Grade: Poor.....	24
S11	Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials.....	25
	Grade: Fair .....	25
S12	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat. ....	26
	Grade: Fair .....	26
S13	The ability to selectively disable utility, transportation, and communication systems in a city for the short or long term.....	27
	Grade: Fair .....	27
S14	Improve infantry's mobility over urban obstacles.....	27
	Grade: Poor.....	27
Engage.....		29
E1	The ability to destroy wide area targets. ....	29
	Grade: Good.....	29
E2	The ability to destroy point targets with minimal collateral damage.....	29

	Grade: Fair.....	29
E3	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.....	31
	Grade: Poor.....	31
E4	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.....	31
	Grade: Poor.....	31
E5	Sniper and counter-sniper capabilities. ....	32
	Grade: Fair.....	32
E6	Urban fire support. ....	33
	Grade: Fair.....	33
Consolidate.....		35
C1	Infrastructure management and repair capabilities.....	35
	Grade: Fair.....	35
C2	Capabilities to reestablish the rule of law in portions of the city under Blue control.....	35
	Grade: Poor:.....	35
C3	The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure.....	36
	Grade: Poor.....	36



## Grade Summary

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### Good: 1

#### *Engage*

E1 The ability to destroy wide area targets.

### Fair: 13

#### *Shape*

S1 The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.

S2 The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas.

S6 Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.

S7 Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion.

S8 Capabilities to communicate with, coordinate with, and influence the local populace.

S11 Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials.

S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.

S13 The ability to selectively disable utility, transportation, and communication systems in a city for the short or long term.

#### *Engage*

E2 The ability to destroy point targets with minimal collateral damage.

E5 Sniper and counter-sniper capabilities.

E6 Urban fire support

#### *Consolidate*

C1 Infrastructure management and repair capabilities.

### Poor: 17

#### *Understand*

U1 The intelligence, surveillance, and reconnaissance (ISR) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.

U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.

- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- US4 The ability to command, control, and communicate with units operating in the urban environment where radio and GPS (Global Positioning) systems work poorly.
- UST5 Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.
- U6 The ISR capability to generate an in-depth understanding of the city's population and its likely future actions and reactions.
- U7 The ability to do urban BDA (Battle Damage Assessment).
- U8 The ISR ability to rapidly generate 3D, small-scale, up-to-date digital maps of the urban battlespace that include subterranean features and possibly building interiors.
- U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces.
- U10 The ability to detect and neutralize mines, booby traps, and toxic chemicals.

*Shape*

- S3 Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire; restricting the ability to command and control movement and fires; and restricting the inflow of information Red needs to make decisions on movement and fires.
- S9 The ability to mislead Red as to the movement and location of Blue forces in the city.
- S10 Conduct small-unit combined arms operations.
- S14 Improve infantry's mobility over urban obstacles.

*Engage*

- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
- E4 Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.

*Consolidate*

- C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.
- C3 The capabilities to mitigate the effects of WMD (weapons of mass destruction) use on urban civilian populations and infrastructure.

## Understand

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**U1 The intelligence, surveillance, and reconnaissance (ISR) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.<sup>1</sup>**

**Grade: Poor**

Nodes can be in relation to the city infrastructure, its inhabitants, or the Red force in the city. While current US capability works fairly well when dealing with the physical infrastructure of a city, the human side of the equation is usually poorly addressed. Locating power, water, and food nodes is easily done today.<sup>2</sup> The human dimension is much more complex,<sup>3</sup> with history, culture, politics, religion, and economics all playing a part.

**Issue:** The two central tools to successfully understanding the human architecture of a city are pre-existing data sources and human intelligence (HUMINT). Much of the information needed to understand the human dimension already exists, but it is scattered throughout libraries, universities, other government agencies, private voluntary organizations (PVOs), non-governmental organizations (NGOs), coalition partners, and ethnic communities within the United States.<sup>4</sup>

**Issue:** The difficulty is learning where all the information is and being able to tap it quickly. HUMINT's role is to keep that picture up to date. The information attained from HUMINT will also fill in the specifics of the city in question while many of the

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<sup>1</sup> The *Handbook on Joint Urban Operations* states that urban intelligence requires a look at every characteristic of the city. US Department of Defense, Joint Staff, *Handbook on Joint Urban Operations*, pp. IV–19, III–5, IV–35. *Joint Vision 2020*, in discussing Precision Engagement, states “Its success depends on in-depth analysis to identify and locate critical nodes and targets.” US Department of Defense, Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, (Washington, DC: US Government Printing Office, 2000), p. 26.

<sup>2</sup> For a description of the information needed about a city's physical infrastructure, see Marine Corps Intelligence Activity, *Urban Generic Information Requirements Handbook*, (Quantico, VA: US Marine Corps, 1998), pp. 45–49.

<sup>3</sup> Ralph Peters, “The Human Terrain of Urban Operations,” *Parameters* (Spring 2000): pp. 4–12.

<sup>4</sup> For a discussion on the untapped intelligence resource potential of NGOs, see LtCol Michael M. Smith (USAR) and Maj Melinda Hofstetter (USMC), “Conduit or Cul-de-Sac? Information Flow in Civil-Military Operations,” *Joint Forces Quarterly* (Spring 1999): pp. 100–105.

pre-existing data sources will provide more general information. Whatever the target type or collection method, the ability to conduct extended “24/7” coverage will sometimes be required to identify a node and its importance.

**U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.**

**Grade: Poor**

Current ISR systems are equipment focused and these systems performed poorly in the urban setting.<sup>5</sup> These ISR systems have great difficulty peering into the crevasses of the city or the interior of buildings, both of which allow for numerous hiding places and the ability to blend with the local populace.<sup>6</sup> When Red forces are in proximity to Blue (a common occurrence in urban combat), differentiating friend from foe becomes very difficult. GPS (Global Positioning System) systems function poorly in buildings so ground units would have difficulty reporting their true location to fire support elements. If Red forces were just across the street from a friendly unit, a location error of only 100 meters for a fire support mission could be disastrous for Blue forces and civilians.<sup>7</sup>

**Issue:** Current ISR assets lack the loitering capability needed for 24-hour coverage. A Red force of light infantry making quick dashes from building to building would be nearly invisible to current ISR assets. A HUMINT network among the civilian population would provide excellent coverage and the ability to gather more in-depth information (e.g., identifying non-locals, explaining why the Red force chose to place a unit in a given location).<sup>8</sup> Today’s special operations forces (SOF) and sniper team personnel, if

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<sup>5</sup> A 1999 Joint Staff study surveyed the CINCs (commanders in chief) and came back with the same conclusion. US Department of Defense – Joint Staff - J8, *Joint Warfighting Capabilities Assessment: Phase One Urban Operations Study* (Washington, DC: US Government Printing Office, 1999), pp. 4–4, 4–5. For more discussion on how current sensors performed poorly in the city, see Robert E. Podlesny, “MOUT: The Show Stopper,” *Proceedings* (February 1998): p. 51.

<sup>6</sup> A 2000 RAND study describes how JSTARS-like aircraft can suffer drastic (-99%) reductions in the total area they can monitor. Alan Vick et al., *Aerospace Operations in Urban Environments*, (Santa Monica, CA: RAND, 2000), pp. 84–87.

<sup>7</sup> A Joint Staff study cited 100-meter GPS accuracy is being insufficient to accurately distinguish friend or foe. It also found 14-meter CEPs (circular error probability) are required for indirect fire. US Department of Defense, Joint Staff, *Military Operations in Urban Terrain C<sup>4</sup>I Study*, (Washington, DC: US Government Printing Office, October 1999): p. 10.

<sup>8</sup> In its 1975 offensive against the South, the North Vietnamese Army used HUMINT networks very successfully to gather intelligence on the defenses of various cities. They would map out the location of all the defending command and control nodes and then attack them. This disintegrated the defenses of the city and made mopping up the remaining defenders much easier. LtCol. R. W. Lamont



infiltrated into the city, could also act as a significant source of intelligence. In tracking Red forces, some sort of tagging capability would be useful.

**U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.**

**Grade: Poor**

What Red *needs* will depend on what Red is planning on *doing*. Denying Red what it needs would be greatly facilitated by an understanding of its plans. Related to this will be an understanding of Red's political goals and commitment level. A "defenseless defense" with light infantry (as used by the Chechen defenders of Grozny in 1995) would require a high degree of movement but less logistical support.<sup>9</sup> Central to this effort is a solid HUMINT capability.<sup>10</sup>

**Issue:** Technical collection capabilities have difficulty matching HUMINT in this area. Signal intelligence (SIGINT) can monitor radio traffic but is not as effective as a face-to-face conversation between a runner-messenger and a local commander. Imagery intelligence (IMINT) can spot a stack of crates behind a building but it has trouble telling if they contain bullets or biscuits.<sup>11</sup> Regardless of the collection method, the surveillance of some targets will require continual rather than episodic coverage.

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(USMC), "Urban Warrior—A View from North Vietnam," *Marine Corps Gazette* (April 1999): pp. 32–33. Brazilian forces operating against organized criminal elements in the slums of Rio de Janeiro in 1994–1995 found the local populace as an excellent source of intelligence. Col. William Mendel (USA, ret.), "Operation Rio: Taking Back the Streets," *Military Review* (May–June 1997).

<sup>9</sup> The Chechen rebels in Grozny in 1995 used what Timothy Thomas calls the "defenseless defense." It was a defensive scheme that relied on mobility to minimize their exposure to Russian firepower and exploit their own knowledge of the local terrain. Timothy L. Thomas, "The Battle for Grozny: Deadly Classroom for Urban Combat," *Parameters* (Summer 1999): p. 95.

<sup>10</sup> The CINCs, through a 1999 Joint Staff study survey, expressed concern that the lack of HUMINT capabilities is a major problem. US Department of Defense, Joint Staff, *Joint Warfighting Capabilities: Phase One Urban Operations Study*, pp. 4–5.

<sup>11</sup> Podlesny, "MOUT: The Show Stopper," p. 51.

**US4 The ability to command, control, and communicate with units operating in the urban environment where radio and GPS systems work poorly.<sup>12</sup>**

Grade: **Poor**

The urban environment is hostile to two central technologies used by US forces for command and control: GPS and radio. GPS signals are used for navigation and to locate friendly forces. Radio communications allow orders and reports to flow up and down the chain of command.

**Issue:** Tall buildings can block both GPS and radio, and neither works well within buildings. Needed are location and communication technologies that are not degraded when personnel enter a building, enter a sewer, or move between buildings.<sup>13</sup> A tagging capability might make this task easier.

**Issue:** These difficulties also create a demand for extremely well-trained small-unit leaders.<sup>14</sup> Relative to non-MOUT activities, these individuals are going to be required to act more autonomously and their actions will have greater potential impact.

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<sup>12</sup> A 1999 study by the Joint Staff stated “Based on radio wave propagation in empirical studies and the analysis of this study, there is no one communication system that is either currently fielded or available ‘off-the-shelf’ which can solve all of the complicated problems of communications in the dense urban environment.” US Department of Defense, Joint Staff, *Military Operations in Urban Terrain CAI Study*, p. 2. In discussing the implications of new information and communications technologies on C<sup>2</sup>, *Joint Vision 2020* states “The potential for overcentralization of control and the capacity for relatively junior leaders to make decisions with strategic impact are of particular importance.” US Department of Defense, Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, p. 40.

<sup>13</sup> For a discussion on the urban communications problems encountered by Russian forces in Grozny see, Lester W. Grau, “Urban Warfare Communications: A Contemporary Russian View,” *Red Thrust Star* (July 1996): pp. 5–10. For details on how poorly some aspects of USC<sup>3</sup> performed in Mogadishu, see Mark Bowden, *Black Hawk Down*, (New York: Penguin, 1999) pp. 112–113, 123–124. Marine Corps Warfighting Laboratory officials believe that operating forces in a discontinuous manner is the key to avoiding historically costly house-to-house fighting. Fred V. Reed, “City Slickers Become Targets of Future Marine Corps Operations,” *Signal* (July 1998): p. 50. During the PROJECT METROPOLIS experiments, 50% of all radio transmissions were command enquires about subordinate location. US Marine Corps, *Project Metropolis: Military Operations on Urbanized Terrain Level Experiments—Experiment After Action Report* (February 2001): p. 24.

<sup>14</sup> Small-units leaders in MOUT are at a point similar to that of pilots in the 1950s and 1960s. At that time, the ability to gather in data for the pilot began to exceed their ability to process it. With the inclusion of steadily more complex equipment and improved reconnaissance capabilities, pilots were saturated. Today’s combat aircraft have cockpits that address that by filtering the information and allowing the pilot to tailor it as needed (e.g., configurable flat panel displays, heads-up displays). As the capability to gather data in the urban environment undergoes a similar expansion, then these small-units leaders will also need help with filtering and tailoring.

**Issue:** Another issue is placing increased demands on small-unit leaders will be handling the inflow of information. Because there is so much to know about the urban environment, the challenge will be how to tailor and filter that information for each intelligence customer. The small-unit leader will not have the time to discern what intelligence is pertinent and what is not. Communications systems should focus on minimizing the workload on both small-unit leaders and all dismounted personnel.

**UST5 Coordination capabilities across Service, agency, coalition partner, and NGO boundaries.**

**Grade:** Fair

Because of the large civilian population, urban operations require dealing with many different agencies and NGOs (i.e., the presence of civilians equals the presence of these other actors).<sup>15</sup> The Joint Force Commander (JFC) is unlikely to have the organic resources to provide even a modicum of support for a large local population; therefore, these other sources of support will need to be tapped. Because of the scale of forces required, urban operations usually require dealing with multiple Services and coalition partners.<sup>16</sup>

**Issue:** This overall expansion in the number of actors present translates into a major coordination problem. In the 1990s, the US military services have had more practice working with “outside” organizations and agencies; however, there is still progress to be made.<sup>17</sup>

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<sup>15</sup> A 1999 Joint Staff study of C4I needs in MOUT mentioned the issue of interoperability between military and civilian communications systems. US Department of Defense, Joint Staff, *Military Operations in Urban Terrain C4I Study*, p. 13. The US military contingent involved in OPERATION RESTORE HOPE had to deal with 49 different NGOs, the US State Department, the US Agency for International Development, the Office of US Foreign Disaster Assistance, and the United Nations. US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 10–19.

<sup>16</sup> A 1999 Joint Staff study found that current MOUT doctrine was neither joint nor interagency. When surveyed, all but one of the CINCs agreed on the need for joint MOUT doctrine. US Department of Defense, *Joint Warfighting Capabilities Assessment: Phase One Urban Operations Study*, pp. i, 4-2. The *Handbook for Joint Urban Operations* states that all the capabilities needed for MOUT will likely not all belong to the JFC. US Department of Defense, Joint Staff, *Handbook*, p. EX-8. A 1999 Joint Staff study stated that the current modernization plans for dismounted communications for the Army and Marine Corps would make the two Services non-interoperable below the platoon level. US Department of Defense, Joint Staff, *Military Operations in Urban Terrain C4I Study*, p. 4.

<sup>17</sup> During the 1992 Los Angeles riots, there were significant problems between deployed military units and the civilian authorities, primarily due to a lack of experience in dealing with each other. Mendel, “Operation Rio: Taking Back the Streets.” Another interesting example of a multinational urban op-

**Issue:** Interoperability is a problem with coalition partners, particularly with C<sup>4</sup>ISR<sup>18</sup> systems.<sup>19</sup> These systems need to be procured with compatible protocols as a required performance parameter.

**Issue:** In addition to being interoperable, training activities need to include the coordination of the various C<sup>4</sup>ISR assets to work out compatible TTPs (tactics, techniques, and procedures).

**Issue:** With regard to NGOs, cultural differences keep the military and NGOs from fully tapping their potential synergies.<sup>20</sup>

**Issue:** On the joint level, joint task forces (JTFs) are still put together on an *ad hoc* basis, undercutting operational-level cohesion.

## **U6 The ISR capability to generate an in-depth understanding of the city's population and its likely future actions and reactions.<sup>21</sup>**

**Grade: Poor**

The two central tools to successfully understanding the human architecture of a city are pre-existing data sources and HUMINT.<sup>22</sup> Most of the information needed to understand the human picture already exists but it is scattered throughout libraries, universities, other government agencies, PVOs, NGOs, coalition partners, and ethnic communities within the United States. The difficult part is learning where all the information is and being able to tap it quickly.

**Issue:** The capability to do that today is insufficient. HUMINT's role is to keep that picture up to date. The information attained from HUMINT will also fill in the specifics of the city in question while many of the pre-existing data sources will provide more general information. Current intelligence efforts tend to emphasize technical intelli-

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eration is the relief of the siege of Peking in 1900. See Peter Harrington, *Peking 1900: The Boxer Rebellion*, (Oxford, UK: Osprey, 2001).

<sup>18</sup> Command, control, communications, computers, intelligence, surveillance, and reconnaissance.

<sup>19</sup> Language barriers with allied forces interfered with efforts to rescue US forces trapped in Mogadishu in 1993. Capt. Mark A.B. Hollis, "Platoon Under Fire: Mogadishu, October 1993," *Infantry* (January–April 1998): pp. 27–34.

<sup>20</sup> Smith and Hofstetter, "Conduit or Cul-de-Sac: Information Flow in Civil-Military Operations," pp. 100–105. See also US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, pp. 10–15.

<sup>21</sup> US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, p. III–10.

<sup>22</sup> For further discussion on the importance of HUMINT, see US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, pp. 10–15.

gence over HUMINT. That traditional emphasis handicaps efforts when the target is human-centric.<sup>23</sup>

#### U7 The ability to do urban BDA (Battle Damage Assessment).

**Grade:** Poor

**Issue:** Currently, BDA is a serious problem with kinetic munitions. Deducing the effect of an attack can be as difficult as conducting the attack itself. In MOUT both the complexity of the terrain and the types of attacks likely to be conducted will magnify the problem. Targets may sometimes be located within large structures or deep underground. In those instances it will be very difficult to discern if the desired effect has been achieved while observing from outside.

**Issue:** This problem is even greater with non-lethal and non-kinetic weapons.<sup>24</sup> Little or no outward physical manifestation of destruction will exist. With non-lethal and non-kinetic weapons, the effects are subtler. IMINT of the outside of a structure will likely be insufficient. ISR assets will need to gauge signatures of, for example, electrical power generation, radio communications, computer activity, internal temperature, human movement, and vibration. Concerns over collateral damage and civilian casualties will likely increase the future use of non-lethal and non-kinetics.

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<sup>23</sup> The US understanding of the Somali cultural and political context was weak. Many of the actions taken ended up having undesirable consequences due to that lack of understanding. Bowden, *Black Hawk Down*, pp. 71–76. One of the lessons learned by Russian forces operating in Grozny w *Aviation Combat Element* was that they needed to win the hearts and minds of the local population. Their failure to do so provided the Chechen rebels with a constant source of intelligence. Thomas Grau, “Russian Lessons Learned from the Battles for Grozny,” p. 47. According to a 2000 study directed by the US Army’s Training and Doctrine Command (TRADOC), “The urban environment is, first of all, a human environment. That makes it different from all other forms of environment. An urban environment is not defined by its structures or systems but by the people who compose it.” Roger J. Spiller, *Sharp Corners: Urban Operations at Century’s End*, (Ft Leavenworth, Kansas, US Army Command and Staff College Press, 2000), p. 5.

<sup>24</sup> *Joint Vision 2020* cited BDA for Information Operations as difficult and in need of attention in future exercises and experimentation. US Department of Defense, Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, p. 36.

**U8 The ISR ability to rapidly generate 3D, small-scale, up-to-date digital maps of the urban battlespace that include subterranean features and possibly building interiors.**

**Grade: Poor**

High-quality digital maps would be needed for planning all operations inside the city: offensive, defensive, and standoff<sup>25</sup> strikes. Without a thorough understanding of the urban topography a JFC will have difficulty navigating forces through the city, guarding avenues of approach, and avoiding collateral damage (especially with standoff strikes).

**Issue:** To rapidly produce high-quality digital maps requires comprehensive pre-existing data sources and/or an ability to surge ISR assets that can produce digital maps quickly.<sup>26</sup> Neither exists today.<sup>27</sup>

**U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and up-dated intelligence information on Red, Blue, and White forces.**

**Grade: Poor**

Commanders in the field need a capability to conduct rehearsals of proposed operations.

**Issue:** The complexity of factors requiring consideration (e.g., Red forces, Blue forces, civilians, collateral damage, complexity of terrain) makes it difficult to evaluate all of the implications of each course of possible action. Some of this calculation could be handed off to computers capable of tracking the implications and consequences (e.g., first-, second-, third-order of effects), and incorporating the latest intelligence from the battlefield information about the city from pre-existing data sources into the rehearsals. These rehearsals could address standoff strikes or actions involving Blue ground forces. The value of rehearsing standoff strikes would be the ability to check for munition flight path problems and collateral damage questions.

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<sup>25</sup> “Standoff” meaning the warfighter can force entry from a hundred meters away rather than having to walk up to the wall.

<sup>26</sup> For a detailed description of the problems and possible solutions to 3D urban modeling, see Vick, *Aerospace Operations in Urban Environments*, (Santa Monica, CA: RAND Corporation, 2000) p. 150-164.

<sup>27</sup> The CINCs, through a 1999 Joint Staff study survey, described the shortcomings in data sources and map products for use in MOUT as “substantial.” US Department of Defense, Joint Staff, *Joint War-fighting Capabilities Assessment*, p. 4-4.

**U10 The ability to detect and neutralize mines, booby traps, and toxic chemicals.**

**Grade:** Poor

The wealth of cover provided by the urban environment makes it ideal for concealing mines and booby traps. This allows Red to deny rapid access to any location, channelize Blue movements, all the while attriting Blue without risk to its own forces.

**Issue:** If Blue lacks effective counters to this low-tech threat, Red will enjoy a substantial defensive advantage. These same tools could be used by Red to terrorize and injure civilians while maintaining a degree of deniability.

**Issue:** Toxic chemicals from industrial facilities in the city, as distinct from chemical weapons, pose another threat. The facilities housing these chemicals could explode or leak because of nearby combat operations. They pose a danger to both Blue personnel and the civilian population. A part of the solution may be some sort of tagging capability to more clearly mark these hazards once discovered.

## Shape

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### **S1 The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.**

Grade: **Fair**

This capability is in heavy demand across all the operational concepts for the CAPTURE AN URBAN AREA mission explored in this paper. Without cutting off Red from outside sources of supply and reinforcements, all efforts at attriting Red, denying it logistical support, or cutting it off from nodes within the city, would be undercut.

**Issue:** Given the size of many large urban areas, the current manpower-intensive methods for sealing off movement are too resource intensive. While ISR assets would cover the gaps between land units, most current ISR assets are too few in number and lack the loitering capability needed for a round-the-clock isolation mission. Those areas not covered by land units or ISR assets would use barriers. But current barrier technology, both lethal and non-lethal, needs major improvement in the areas of: emplacement time, resistance to tampering, portability, and counter-movement ability.<sup>28</sup>

### **S2 The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas.**

Grade: **Fair**

Sectors of the city can be sealed off effectively today, but the number of troops required is very large. Unlike in open terrain, small groups of US personnel cannot guard large pieces of real estate—the urban environment provides too much cover.

**Issue:** Today's ISR assets are too few to cover the gaps between ground forces.

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<sup>28</sup> Reportedly, Russian forces required 50,000 troops to seal off Grozny in 2000. Even if US forces needed only half that number because of its better ISR capabilities, the demands on a JFC's force would be crippling. Timothy L. Thomas, "Grozny 2000: Urban Combat Lessons Learned," *Military Review* (July-August 2000): pp. 54-56. In a study of 22 urban battles, a Marine Corps MOUT manual found the following. "The attacker won all battles where the defender was totally isolated. Even partial cut-off of the defenders resulted in attackers enjoying a success rate of 80 percent. Conversely, attackers won only 50 percent of the battles in which defenders were not significantly cut off, and that victory came at great cost." US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, pp. 1-23.



**Issue:** Today's barrier technologies, both lethal and non-lethal, are too easily breached and/or too time consuming to emplace.<sup>29</sup>

**S3 Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire; restricting the ability to command and control movement and fires; and restricting the inflow of information Red needs to make decisions on movement and fires.**

**Grade: Poor**

This capability envisions three levels of paralysis being inflicted upon Red's ability to both move and fire.

- ▶ A Red unit might get a radio call from a Red commander to move, but that unit might be hemmed in by some sort of barrier.<sup>30</sup>
- ▶ A Red commander might want a Red unit to execute a fire mission, but jammed communication links might keep the message from reaching that unit.
- ▶ A Red commander might not even give the order to fire on a Blue unit because a breakdown in intelligence collection denied him the knowledge of the Blue unit's location.

Whatever the method, the effect is the same—paralysis. The particulars of the conflict will determine which of these levels are most attainable and/or effective.

**Issue:** Restricting Red's physical movement will require much better barrier technology than is in use today.<sup>31</sup> These barriers need to be quickly deployable, resistant to tampering, have a reasonable logistical footprint, have remote deployment options, and have non-lethal options

**Issue:** Restricting Red's physical ability to fire is more difficult, but this could take the form of jamming guidance systems or disabling electronics (e.g., via conventionally generated EMP (electro-magnetic pulse)). Jamming communications links is done today, but

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<sup>29</sup> About six months after Russian forces completed their high-cost assault on Grozny in 1995, Chechen rebels were able to infiltrate back into the city and attack the Russian forces from within. After several months of fighting the Russians declared victory and left the city to the rebels. Capt. Chad A. Rupe, "The Battle for Grozny," *Armor* (May–June 1999): p. 21.

<sup>30</sup> *Joint Vision 2020* lists counter-mobility as one of the basic components of Dominate Maneuver. US Department of Defense, Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, DCUSp. 26.

<sup>31</sup> Countermobility was called "an integral part of the overall plan..." in regards to urban defensive operations in a Marine Corps Combat Development Command 1997 article. LtGen Paul K. Van Riper (USMC), "A Concept for Future Military Operations on Urbanized Terrain," *Marine Corps Gazette* (October 1997), p. A4.

some of the commercial communications that would be available to a Red force might pose some unique problems.<sup>32</sup> The broken up lines of sight in the city require communications systems (at least with today's technology) that use a network of retransmission nodes scattered throughout the urban area. To counter those scattered nodes it may be required to distribute jamming systems in a similar manner, scattered throughout the city. Today's standoff jamming systems may or may not prove adaptable.<sup>33</sup>

**Issue:** Denying Red the information it needs to make decisions on movement and fires is equally difficult. The higher density of media (e.g., the "CNN effect") in the city makes stealthy movement challenging.<sup>34</sup> Working in Blue's favor is the wealth of cover provided by the city. A wildcard involved will be the disposition of the local population.<sup>35</sup> A hostile population will provide Red with a difficult-to-counter HUMINT network covering most of the city. IO and EW offer options to improve intelligence disruption capabilities.

**S6 Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.**

**Grade: Fair**

Currently, our helicopters can fly to interior locations in a city, but they are vulnerable to MANPADs (man-portable air defenses), small arms and rocket-propelled grenades, especially during the takeoff-landing-hovering phases.

**Issue:** Current armored infantry transports (M-113s, Bradleys, light armored vehicles (LAVs) and amphibious assault vehicles (IAAVs)) lack the survivability to live in an RPG-rich environment. Both Russian and Israeli forces have concluded that current

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<sup>32</sup> Chechen forces in Grozny used cellular phones to communicate in a more effective manner than how Russian forces communicated in the city. US Department of Defense, Joint Staff. *Handbook for Joint Urban Operations*, p. IV–10. Militia forces in Mogadishu were at least partially successful in using cellular telephones for intelligence and communications. US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 11-2.

<sup>33</sup> US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 8-2.

<sup>34</sup> US Department of Defense, Joint Staff. *Handbook for Joint Urban Operations*, p. III–18.

<sup>35</sup> For an in-depth discussion of the role deception can play in MOUT, see Scott Gerwehr and Russell W. Glenn, *The Art of Darkness* (Santa Monica, CA: RAND, 2000).

generation armored personnel carriers (APCs) are inadequate for MOUT in a high-threat environment and have developed tank-like vehicles for their infantry.<sup>36</sup>

**Issue:** Rubble-clogged narrow streets will also present a problem. Engineering assets capable of either clearing roads or creating new pathways for vehicles will be needed.

**Issue:** Those same engineering assets will also need to cope with mines and booby traps. Currently, most land supply and medical transports are soft-sided and thus ill-suited for crossing unsecured territory. Improvising could be done by enlisting APCs for transport duties, as was done in both Lebanon and Chechnya, but that is an inefficient solution. Dedicated armored transport vehicles are needed.

**Issue:** Improvements are also needed in protecting forward medical facilities.<sup>37</sup> Improvements in high-altitude supply drop capability (possibly with GPS-guided parasails) would ease the ground transport burden and avoid much of the MANPAD threat.<sup>38</sup>

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<sup>36</sup> Jim Warford, "The Resurrection of Russian Armor: Surprises from Siberia," *Armor* (September-October 1998): pp. 30–33. Marine Corps Intelligence Activity, *Urban Warfare Study: City Case Studies Compilation* (Quantico, VA: US Marine Corps, 1999), p. 32. Capt. James D. Leaf, "MOUT and the 1982 Lebanon Campaign: The Israeli Approach," *Armor* (July–August 2000): pp. 8–11.

<sup>37</sup> Russian troops in Grozny relied more on armored personnel carriers rather than helicopters to evacuate wounded, especially after the Chechens shot down several helicopters. Lester W. Grau, and Dr. William A. Jorgensen, D.O., "Handling the Wounded in a Counter-Guerrilla War: The Soviet/Russian Experience in Afghanistan and Chechnya," *US Army Medical Department Journal* (January–February 1998).

<sup>38</sup> For two accounts of the resupply/reinforcement difficulties in 1993 in Mogadishu, see Capt. Mark A. B. Hollis, "Platoon Under Fire: Mogadishu, October 1993," pp. 27–34, and Mark Bowden, *Black Hawk Down*. A 1999 Joint Staff study surveyed the CINCs who responded that today's logistical system was too focused on supplying large groups rather than the small dispersed groups likely in MOUT. US Department of Defense, *Joint Warfighting Capabilities Assessment*, p. 4–3. The convoy sent to rescue the trapped US personnel in Mogadishu in 1993 took 10 hours to reach them. US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, p. IV–33. For a discussion of the threats posed to medical support personnel in MOUT, see LCdr. Charles J. Gbur, Jr., "Battalion Aid Station Support of Military Operations on Urbanized Terrain," *Marine Corps Gazette* (February 1999): pp. 22–25.

**S7 Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion.<sup>39</sup>**

Grade: Fair

Even when not operating in a dispersed fashion, Red forces will be much closer to Blue forces and consequently closer to any CSS (Combat Support System) elements that meet up with Blue combat forces.

**Issue:** Given that these vehicles will come under some kind of fire, soft-sided vehicles for supply and ambulance functions are inappropriate. Current forces can substitute APCs for these duties and hand off the task to CSS elements once away from Red forces. But this will drain away important combat power from the troops in contact with Red. Armored vehicles for CSS are needed.<sup>40</sup> Making this task even more difficult is the historically high usage rates of a wide range of ammunition and supplies in the MOUT.<sup>41</sup>

**S8 Capabilities to communicate with, coordinate with, and influence the local populace.**

Grade: Fair

Current systems can do leaflet drops, radio, and TV broadcast and reach almost any population.

**Issue:** The language skills and cultural expertise needed for creating the right message do exist, but not necessarily within one service or agency. HUMINT capabilities, an es-

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<sup>39</sup> A finding of PROJECT METROPOLIS was that CSS must work on bringing supplies forward before they focus on bringing casualties to the rear. To do otherwise was found to increase overall casualty figures. US Marine Corps Warfighting Laboratory, *Project Metropolis: Military Operations on Urbanized Terrain Battalion Level Experiments—Experiment After Action Report*, p. 21.

<sup>40</sup> Lester W. Grau, and Timothy L. Thomas, “ ‘Soft Log’ and the Concrete Canyons: Russian Urban Combat Logistics in Grozny,” *Marine Corps Gazette* (October 1999): pp. 67–75. Another possible CSS solution is the use of small logistical vehicles. During the PROJECT METROPOLIS experiments, the “Gator” six-wheel vehicle proved very successful. The Gator also proved to be the most survivable vehicle in the experiments. US Marine Corps, *Project Metropolis*, pp. 22, 25, and Enclosure I, page 12.

<sup>41</sup> Russell W. Glenn, *Heavy Matter*, (Santa Monica, CA: RAND Corporation, 1996), p. 12. During World War II, it was common for a US infantry battalion to use over 500 hand grenades per day while engaged in MOUT. US Department of the Army, *An Infantryman’s Guide to Urban Combat*, Field Manual 90-10-1, (Washington, DC: US Government Printing Office, 1993), pp. 8–26. During the 30-day battle for Hue, US Marine units fired nearly 20,000 rounds of 60mm and 81mm high explosive (HE) mortar ammunition, 13,000 rounds of other artillery ammunition, and received 5,000 rounds of naval gunfire support. US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, pp. 1–20, 1–35.

sential element in dealing with the civilian population, would need bolstering.<sup>42</sup> The organization of the effort, the coordination with all the agencies and nations possessing the needed expertise, and the coordination with other actions in the region would be central to determining success. To date that level of coordination has not often been exhibited.<sup>43</sup>

## **S9 The ability to mislead Red as to the movement and location of Blue forces in the city.**

**Grade: Poor**

Today's civilian communications technologies make keeping any activity in a city secret, let alone a major movement of military forces, very difficult. The media (higher density in the cities), the local civilians, and the Red force would all have access to these technologies. Working in favor of the Blue force would be the cover city structures provide and the background "white noise" of civilian activity (e.g., the usual communications and movements of the population).<sup>44</sup> Working against Blue would be the large number of potential HUMINT assets for Red among the populace.<sup>45</sup>

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<sup>42</sup> The *Handbook on Joint Urban Operations* mentions the importance of HUMINT three separate times in dealing with the locals. US Department of Defense, Joint Staff. *Handbook for Joint Urban Operations*, pp. EX-5, III-9, IV-35.

<sup>43</sup> A Marine Corps handbook on urban intelligence requirements cites the social fabric of a city as potentially the most important factor in conducting MOUT. Marine Corps Intelligence Activity, *Urban Generic Information Requirements Handbook*, p. 27. A 1996 RAND report stated that the ability to communicate with civilians and restrict their access to high-risk areas was necessary if non-combatant casualties were to be reduced. Russell W. Glenn, *Combat in Hell*, (Santa Monica, CA: RAND Corporation, 1996), p. xi.

<sup>44</sup> The CINCs, through a 1999 Joint Staff study survey, described a need for more work in the area of urban camouflage. US Department of Defense, Joint Staff, *Joint Warfighting Capabilities Assessment*, p. 4-4. For a discussion of how the activities of the local populace can be used as cover by a military force, see Glenn, *Heavy Matter*, pp. 33-34.

<sup>45</sup> For a detailed discussion of the role deception can play in MOUT, see Scott Gerwehr and Russell W. Glenn, *The Art of Darkness* (Santa Monica, CA: RAND Corporation, 2000). According to *The Washington Post* in 2001 right-wing paramilitary forces evicted leftist rebels from a medium size city estimated at 200,000 in population) in northern Colombia. Afterward, in an effort to disable the rebel early warning network, the paramilitaries confiscated the cell phones of residents in some neighborhoods. Scott Wilson, "Colombian Right's 'Cleaning' Campaign," *The Washington Post*, 17 April 2001, p. A01.

**S10 Conduct small-unit combined arms operations.<sup>46</sup>****Grade: Poor**

The organization, training, and doctrine of US forces pay considerable attention to combined-arms operations. However, this focus is not at a low enough level to be effective for urban operations.

**Issue:** The terrain in the city is so constrained that operating a full tank battalion with a full Bradley battalion is not practical. If a city's narrow streets do not allow more than two or three tanks to support each other at any one time, then these tank groups need to be able to work with small groups from other branches of the force.<sup>47</sup> In the city the full potential of each branch can only be realized if it is used in concert with the other branches. The basic tenants of combined-arms theory still hold but just at a smaller scale.<sup>48</sup>

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<sup>46</sup> The Army's FM 90-10-1 states "Tank-heavy forces could be at a severe disadvantage during combat in built-up areas, but a few tanks working with the infantry can be most effective, especially if they work well together at the small-unit level." US Department of the Army, *An Infantryman's Guide to Urban Combat*, pp. 8–36. One of the "foremost" findings of the Marine Corps' PROJECT METROPOLIS was the importance of achieving the combined arms effect in MOUT. During the URBAN WARRIOR experiments, a predominantly infantry force suffered 48% casualties. During PROJECT METROPOLIS, the careful application of combined arms forces resulted in that casualty rate dropping to 21%. US Marine Corps, *Project Metropolis*, pp. 1, 7. An interesting historical contrast can be made between Hue (1968) and Suez City (1973, Israel vs. Egypt). At Hue the US Marines used M48 tank and Ontos (6x106 recoilless rifles) fire support in close coordination with infantry with good results. At Suez City the Israelis allowed their armor to charge into the city without infantry support and suffer heavy losses as a result. All of the tank commanders of the lead battalion were wounded or killed. US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, pp. 1–18 to 1–19.

<sup>47</sup> For a discussion on the role of armor in the urban battles of Hue (1968) and Khorramshahr (1980), see LtCol. R. W. Lamont, "Tale of Two Cities—Hue and Khorramshahr," *Armor* (May–June 1999): pp. 24–26. For the role of infantry in MOUT, see Capt. Scott E. Packard, "Bottom Line: It's Infantry," *Proceedings* (November 1998): pp. 28–31. For the role of rotary-wing aviation, see Maj. Harry J. Hewson, "Light/Attack Helicopter Operations in the Three Block War," *Marine Corps Gazette* (April 1999): pp. 25–27. For the role of aerospace, see Lt. Gen. Norton A. Schwartz (USAF) and Col. Robert B. Stephan (USAF), "Don't Go Downtown Without Us," *Aerospace Power Journal* (Spring 2000): pp. 3–11. For the role of engineers, see Jeb Stewart, "Engineers, Army After Next, and Military Operations in Urban Terrain," *Engineer* (March 1999): pp. 17–19.

<sup>48</sup> "The guiding principals for the combined arms attack do not change in the urban environment." US Marine Corps, *Project Metropolis*, p. 17. During operations in Grozny in 1995, Russian forces suffered heavy armor losses (APCs and tanks) initially. Those losses dropped substantially once more dismounted infantry was used with the armored vehicles. Lester W. Grau, "Russian-Manufactured Armored Vehicle Vulnerability in Urban Combat: The Chechnya Experience," *Red Thrust Star* (January 1997): pp. 16–19. For a description of how Russian forces pushed artillery and aviation support down to smaller units in the second conflict in Chechnya, see Anne Aldis, *The Second Chechen War*,

**S11 Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials.**

Grade: Fair

**Issues:** Urban health threats come from five sources.

- ▶ **Sewers.** If the city sewers are used for movement or patrolled by Blue forces, those forces will be exposed to a range of hazardous chemical and biological substances.
- ▶ **Disease.** The population itself. The high density of civilians living in the city, combined with the likely disruption of the local food-water-medical infrastructure, will form a breeding ground for infectious disease.<sup>49</sup>
- ▶ **Corpses.** The large number of bodies likely to be strewn about. The total body count in an urban fight will be higher simply because of the greater number of people present (namely civilians) in the combat zone. Disposing of those bodies will be difficult because some will be buried under rubble and the close Red–Blue proximity will make such duty dangerous.
- ▶ **Stress.** The increased psychological stress associated with urban combat. Historically, the proximity of the combatants to each other and the civilian population has led to increased psychological casualties. Troops tend to “burn out” faster than those in non-urban combat.<sup>50</sup> In a major urban fight, the demands

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Occasional Paper No. 40 (Shrivenham, UK: Strategic and Combat Studies Institute, 2000): pp. 92–94. For an article calling for modifications to the Abrams tank to make it more capable of contributing to the combined arms team, see Sergeant First Class Ira L. Partridge, “Modifying the Abrams Tank for Fighting in Urban Areas,” *Armor* (July–August 2001): pp. 19–24. In an article recounting experiences in Panama City in 1989, Maj Robert G. Boyko wrote, “City fighting is truly a platoon and squad leaders’ fight.” “I cannot say enough about the performance of the Sheridan tanks that supported us.” “I found that we had to break down the engineer units into smaller elements than we normally did in training.” Maj Robert G. Boyko, “Just Cause MOUT Lessons Learned,” *Infantry* (May–June 1991): pp. 30–32.

<sup>49</sup> Marine Corps Intelligence Activity, *The Urban Century: Developing World Urban Trends and Possible Factors Affecting Military Operations* (Quantico, VA: US Marine Corps, 1997), pp. 4–5. The *Handbook for Joint Urban Operations* also describes the health threat to Blue personnel from cities with poor infrastructure. US Department of Defense. Joint Staff, *Handbook for Joint Urban Operations*, p. II–2.

<sup>50</sup> Timothy L. Thomas and Major Charles P. O’Hara, “Combat Stress in Chechnya: The Equal Opportunity Disorder,” *Army Medical Department Journal* (January–March 2000). See also Marine Corps Intelligence Activity, *The Urban Century: Developing World Urban Trends and Possible Factors Affecting Military Operations* (Quantico, VA: USMC, 1997), p. 25. See also US Department of the Army, *An Infantryman’s Guide to Urban Combat*, p. I–6.



placed on current US psychological support elements would likely overwhelm them.

- **Hazardous materials.** HAZMAT likely to be encountered. Industrial facilities in the city would likely house a range of dangerous chemicals. Current US chemical and biological protection gear would be reasonably effective against this threat but cumbersome for extended wear. If all the personnel operating in the city had to carry out their duties wearing such gear, their effectiveness would suffer. Depending on how hot the climate was, extended wear of this gear could itself pose a health risk.

## **S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.**

**Grade: Fair**

A basic characteristic of urban combat is short engagement ranges.<sup>51</sup> Those shorter ranges translate into an increased role for small arms.

**Issue:** Currently, body armor is issued to US forces only on a sporadic basis and that armor is too heavy. What's needed is "standard issue" body armor that is light enough for everyday wear by all troops.<sup>52</sup> This armor also needs to provide coverage over a large portion of the body and protect against 7.62mm armored penetration (AP).<sup>53</sup>

**Issue:** Blast and heat are also of increased concern because of the amount of time personnel will spend in buildings. High explosive (HE) and thermobaric warheads impart a much greater blast and heat effect on personnel if they detonate inside a room containing personnel. Given that civilian structures often have a large number of openings, like windows and doors, through which munitions might enter, this threat needs to be addressed in the protective equipment given all personnel.<sup>54</sup>

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<sup>51</sup> In urban combat 90% of engagements occur at 50 meters or less. US Department of the Army, *An Infantryman's Guide to Urban Combat*, p. 8–1.

<sup>52</sup> The CINCs, through a 1999 Joint Staff study survey, expressed this same need. US Department of Defense, *Joint Warfighting Capabilities Assessment*, p. 4–3.

<sup>53</sup> Israeli forces in Lebanon in 1982 estimated that their casualties would have been 20% higher had their personnel not worn flak jackets. Marine Corps Intelligence Activity, *Urban Warfare Study City Case Studies Compilation* (Quantico, VA: USMC, 1999), p. 30.

<sup>54</sup> A Marine Corps After Action Report on PROJECT METROPOLIS states "Existing force protection equipment and doctrine must be re-evaluated in light of the emergence of thermobaric weapons." US Marine Corps, *Project Metropolis*, Enclosure 1, p. 3.



**S13 The ability to selectively disable utility, transportation, and communication systems in a city for the short or long term.<sup>55</sup>**

Grade: **Fair**

Current precision munitions can accurately hit almost any stationary target. The lethality of these munitions is sufficient to disable most utility, transportation and communication nodes for the long term. Non-kinetic warheads (e.g., carbon fiber wire dispensing warheads for the Tomahawk) can disable some power generation and transmission facilities for the short term. Some communication facilities can be disrupted by jamming aircraft (e.g., EC-130).

**Issue:** The overall ability to disable utility and communication facilities for the short term is too limited. Carbon fiber wire warheads cannot affect buried cables. Communications jamming requires a low-density –high-demand jamming aircraft to be in proximity to the transmission point and fiber optic cables cannot be jammed from the air. The range of targets that can be disabled for the short-term needs expansion and the range of effects needs to be more “dial-able.” IO operations do offer some promise for conducting remote infrastructure control without long-term damage.

**S14 Improve infantry’s mobility over urban obstacles.**

Grade: **Poor**

In the urban environment, infantry mobility confronts three sets of issues.

- **Issue:** Wall breaching. While doors and window will often be available for entering a structure, they are also predictable points of entry that may be blocked, booby-trapped, or covered by enemy fields of fire. The infantry needs the capability to make their own entryways through any type of wall. This capability also needs to be a standoff one because any task that requires troops to pause out in the open will unnecessarily increase casualties.<sup>56</sup>

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<sup>55</sup> Targeting and/or controlling infrastructure nodes can gain the JFC operational advantage. US Department of Defense, Joint Staff. *Handbook for Joint Urban Operations*, p. III–4.

<sup>56</sup> During the PROJECT METROPOLIS experiments, forces outside of buildings suffered casualty rates approaching 10%. Once inside of buildings the casualty rate dropped to 2%. US Marine Corps, *Project Metropolis*, p. 19. “The marines quickly realized that forces moving along streets were extremely vulnerable, and they resorted to using LAWs (light antitank weapons) and C-4 explosives to create their own avenues of approach to get into a position to defeat the enemy.” Capt Jon E. Tellier, “The Battle for Hue,” *Infantry* (July–August 1995): p. 26.

- ▶ **Issue:** Vertical movement. The infantry need options for entering buildings from any floor including the top. This makes it more difficult for defenders in a building to know which avenue of approach to expect. This ability to scale buildings might be in the form of hoists that remotely affix to the roof, grappling hooks and ladders for smaller buildings, or some form of individual vertical lift device. Whatever the method, these tools need to be available at the squad or platoon level, and they need to keep exposure time outside the building to an absolute minimum. Any technologies that would allow building-to-building movement while avoiding the street level would be beneficial.
- ▶ **Issue:** Personal load. The load carried by each soldier. The confining nature of the urban environment will require individual soldiers to carry less weight and bulk. Climbing through breach holes and windows, running up stairs, and dashing across streets will all be too taxing with a 70-pound load. The overall loads need to be lighter and packs need to be more compact and less likely to snag on things like rebar and door handles.<sup>57</sup>

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<sup>57</sup> The British Army has learned from its urban operations in Northern Ireland that the loads carried by each soldier need to be dramatically lighter. Marine Corps Intelligence Activity, *Urban Warfare Study*, p. 44. The After Action Report to PROJECT METROPOLIS cited the need for a small urban assault backpack on the back of every Marine in MOUT. US Marine Corps, *Project Metropolis*, Enclosure 1, p. 15.

## Engage

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### E1 The ability to destroy wide area targets.

Grade: **Good**

Current capabilities versus area targets are good. While the density of urban structures provides for *a bunker on every block*, today's indirect fire systems (e.g., 155mm, 120mm mortar, 5-inch naval gun, MLRS (Multiple-Launch Rocket System)) and aviation (e.g., B-52, B-1, B-2) can still address area targets.

**Issue:** However, the expenditure of ammunition versus urban area targets will likely be higher.<sup>58</sup>

### E2 The ability to destroy point targets with minimal collateral damage.

Grade: **Fair**

Current precision munitions (e.g., laser-guided bombs, JDAM (Joint Defense Attack Munitions), JSOW (Joint Stand-Off Weapon), Tomahawk, CALCM (Conventional Air Launched Cruise Missile), Hellfire, TOW (tube-launched optically-tracked wire-guided missile), Javelin, Copperhead) are fairly effective at pinpoint attack of urban targets.<sup>59</sup> Many of these munitions are also effective versus armored targets like bunkers and armored vehicles. This capability should be viable in all weather conditions and at night.

**Issue:** The primary weakness of these weapon systems is in the area of collateral damage—many current munitions are too destructive. In the urban environment, targets are

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<sup>58</sup> Russian forces in the second Chechen campaign made extensive use of thermobaric warheads on a range of munitions. These weapons produce 1.5-2 times the overpressure of conventional HE warheads. Because thermobaric weapons have their effects amplified when detonated within structures, they have proved very effective for selected applications in MOUT. For details on the Russian experience, see Aldis, *The Second Chechen War*, pp. 102–107. A Marine Corps After Action Report to PROJECT METROPOLIS stated that the Marine Corps should explore the utility of these weapons for future MOUT. US Marine Corps, *Project Metropolis*, Enclosure 1, p. 3.

<sup>59</sup> However, shaped charged warheads do have some limitations versus structures. They usually blow a small hole in a wall that produces only limited spalling (the dispersal of fragments) inside. And most of their overpressure is dissipated outside the building. A Marine Corps MOUT manual stated “Shaped Charge warheads are not optimized against urban structures.” US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 5–63.

often very close to neutral or friendly people or structures.<sup>60</sup>

**Issue:** A second problem of current munitions is flight trajectory, especially with ground-launched munitions. Some targets will require very steep angles of approach to hit without striking other tall structures.

**Issue:** A third problem is in the area of reaction times.<sup>61</sup> The proximity of Red and Blue forces along with the difficulty in tracking targets in the urban clutter will require targets be attacked with minimal delay. Today's fire support organization and equipment will not be able to react fast enough in many situations.<sup>62</sup>

**Issue:** Finally, some of the smaller PGMs (precision-guided missiles) have minimum controllable range restrictions (TOW and Hellfire are both 500 meters) that do not fit well with the shorter engagement ranges likely in MOUT.<sup>63</sup>

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<sup>60</sup> The "Danger Close" distances for some common munitions are: Mk 84 2000-lb bomb (500m), Mk 82 500-lb retarded bomb (375m), 70mm rockets (200m). US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 5–40.

<sup>61</sup> Russian artillery in Grozny in 1995 had difficulty reacting fast enough to fleeting targets. The Chechen defenders knew of the Russian propensity to preplan most of their fire support and took advantage with shoot-and-scoot tactics. The Russians countered by breaking up their artillery units and parceling them out directly to smaller units, thus reducing the reaction time by creating a closer fire support supply and demand relationship. Maj. Gregory J. Celestan, "Red Storm: The Russian Artillery in Chechnya," *Field Artillery* (January-February 1997): 42-43.

<sup>62</sup> A 2000 RAND report stated that the urban landscape demands more speed for engaging targets than any other environment. Russell W. Glenn, *Heavy Matter*, pp. CARAND10-11.

<sup>63</sup> Podlesny, "MOUT: The Show Stopper," pp. 51–52. The Army's FM 90-10-1 states, "Both the Dragon and TOW missiles have a minimum arming distance of 65 meters, which severely limits their use in built-up areas." US Department of the Army, *An Infantryman's Guide to Urban Combat*, p. 8–19. This shorter range figure refers to when the warhead fuse first activates. The longer 500m figure refers to when the soldier directing the weapon can gain control of its flight path. A capability with real potential for engaging targets in the urban environment is thermobaric weapons. Thermobaric weapons, or fuel-air explosives, use pressure and heat rather than fragmentation to achieve their effects. That allows their effects to be non-line of sight. This class of weapons is actually more effective versus targets inside buildings than targets in the open. Russian forces used them extensively in Grozny. While their use would require careful consideration of collateral damage effects, thermobaric munitions could negate much of the benefits of urban cover. Lester W. Grau and Timothy Smith, "A Crushing Victory: Fuel-Air Explosives and Grozny 2000," *Marine Corps Gazette* (August 2000): pp. 30–33.

**E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.**

Grade: **Poor**

Buildings can be cleared today. However, the cost in casualties, the large number of infantry required, and the time required makes today's level of capability inadequate.

**Issue:** Current reconnaissance capability can tell little about the who-what-where of a building's defenders. Current tactics also place any civilians in a building, and the building itself, at great risk.<sup>64</sup>

**E4 Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.**

Grade: **Poor**

Other than tear gas, easily countered with commercially available gas masks, there is no effective non-lethal volumetric weapon in the US inventory.<sup>65</sup> In the urban environment, people are a central element of the terrain.<sup>66</sup> When that factor is combined with a general aversion to civilian casualties in the American political culture, you have what Red is likely to see as a US center of vulnerability.

**Issue:** A crowd marching on a US roadblock could be more effective for Red than a company of its own troops. Red is probably going to use the populace (with or without its consent) of the city for both defensive and offensive military purposes. What is

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<sup>64</sup> The difficulty in clearing buildings can be illustrated by the account of "Pavlov's House" in Stalin-grad in 1942. A Soviet Sergeant Jacob Pavlov managed to cram 60 troops, anti-tank guns, heavy machineguns, mortars, and snipers into one four-story building. The building held out for 58 days against numerous German assaults. John A. English and Bruce I. Gudmundsson, *On Infantry* (Westport, CT: Praeger, 1994), pp. 93–94. For a discussion on how today's doctrine on clearing buildings is unsuitable for some urban operations, see Capt. Stephen J. Greene, "MOOTW: Fighting the Close Quarter Battle," *Marine Corps Gazette* (September 1996): pp. 85–86. For an opinion that views today's SWAT-style MOUT tactics as dangerous for the infantry, see LtCol. Thomas X. Hammes, "Preparing for Today's Battlefield," *Marine Corps Gazette* (July 1997): pp. 56–62. "A ten-story apartment complex, which we often found in Panama City, is quite an objective for a two-company force. But it can be cleared if the force has six hours, if the encircling force can seal the area, and if the searching force is well organized and trained for clearing buildings. Boyko, "Just Cause MOUT Lessons Learned," p. 30.

<sup>65</sup> US forces in Hue (1968) used tear gas to clear NVA infantry from a building. Tellier, "The Battle for Hue," p. 24. However, the US ratification (1997) of the Chemical Weapons Convention would make future use of tear gas in combat illegal. The fifth General Obligation under Article I of the Chemical Weapons Convention states "Each State Party undertakes not to use riot control agents as a method of warfare."

<sup>66</sup> Peters, "The Human Terrain of Urban Operations."

needed is the ability to disburse and subdue large masses of people without causing serious injury or death.<sup>67</sup>

**Issue:** The same capability is needed for civilians located inside of a structure. The creation of non-lethal barriers could also aid in controlling the movement of both Red and the noncombatants. There may be instances when using a non-lethal capability against Red is desirable. If Red forces were occupying a building that was very sensitive to damage, non-lethals could be used to drive out the Red force or allow their capture in the building without damaging it.

## **E5 Sniper and counter-sniper capabilities.**

**Grade:** Fair

**Issues:** Current offensive sniper capabilities are quite good. However, two areas of concern are the proportion of personnel trained as snipers and the proportion of time devoted to training in the urban environment.

- ▶ Snipers are going to be a high-demand – low-density asset in urban operations.<sup>68</sup> The current number of personnel trained as snipers may not be sufficient for future urban fights.
- ▶ Also, the current emphasis on sniper training in a rural environment neglects some urban unique skills relating to camouflage, terrain characteristics, and movement limitations.<sup>69</sup> Today's urban counter-sniper capabilities are also problematic relative to the capabilities in the rural environment. Human eyes and ears carry the bulk of the detection workload. Hearing where a shot came from in the echoing urban canyons is very difficult. Seeing where a shot came from when the shooter has fired from deep inside a room is just as difficult.<sup>70</sup>

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<sup>67</sup> According to a 1996 RAND report, "US military doctrine has yet to confront the necessity of pacifying a major city while protecting its citizens." Glenn, *Combat in Hell*, p. 16. For a discussion of the tactical to strategic potential of non-lethals, see Dennis B. Herbert, "Non-Lethal Weaponry: From Tactical to Strategic Applications," *Joint Forces Quarterly* (Spring 1999): pp. 87–91. The CINCs, through a 1999 Joint Staff study survey, called for the greater exploitation of non-lethal weapons. US Department of Defense, Joint Staff, *Joint Warfighting Capabilities Assessment*, p. 4–4.

<sup>68</sup> A 1999 Marine Corps study cited lessons learned about snipers in MOUT. The Russians found snipers essential but in short supply in Grozny. The Israelis found snipers extremely cost effective in Lebanon. Marine Corps Intelligence Activity, *Urban Warfare Study*, pp. 15, 28–29.

<sup>69</sup> British forces operating in Northern Ireland found snipers to be more effective in urban environments than they were in rural settings. Marine Corps Intelligence Activity, *Urban Warfare Study*, p. 45.

<sup>70</sup> The fighting in Grozny taught the Russians the value of snipers. 1Lt. James Reed, "The Chechen War: Part III," *Red Thrust Star* (October 1996). When doing Grozny the second time around (Febru-

## E6 Urban fire support.

Grade: Fair

**Issues:** Urban fire support refers to the dynamic and flexible retasking of all elements of combined arms in support of friendly ground troops in proximity to the enemy. The fire support mission in the urban environment is substantially more difficult because of several factors.

- ▶ One is the low arching trajectories of many US indirect munitions. Taller buildings could block these flight paths. To a lesser extent aircraft delivered munitions also suffer from the same limitation.<sup>71</sup> Some direct fire systems may also have difficulty engaging nearby targets because of elevation and depression limitations on weapons.<sup>72</sup>
- ▶ A second limitation relates to attack helicopters. A standard operating principle for attack helicopters is to fly very low, often in between terrain features rather than over them. Unlike fixed-wing aircraft, they cannot rely on speed for protection so the ability to place terrain features between themselves and threats is central to their survival. However, at those altitudes the swirling and unpredictable currents around tall buildings (not unlike mountainous terrain) makes that modus operandi very hazardous. If helicopters were forced to fly higher, their vulnerability to all manner of air defenses would increase significantly, thus limiting their ability to contribute fire support.
- ▶ A third major limitation is the need for low collateral damage. The concern is for excessive damage to the city's infrastructure, civilian casualties, and friendly forces in proximity to Red. Many of the munitions used by today's US fire support systems are either too destructive or too imprecise for the urban environment.<sup>73</sup>

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ary 2000) the Russians began by inserting more than 200 snipers into the city. Timonthy L. Thomas, "Grozny 2000: Urban Combat Lessons Learned," p. 51. In the second Chechen conflict Russian forces initially tried to use conscript troops for snipers. But these troops proved unequal to the task and were replaced by professional personnel from the special forces. Aldis, *The Second Chechen War*, p. 107. In Stalingrad one Soviet Army had 400 snipers in the city, who collectively killed over 6,000 Germans. During the battle for Seoul in 1950, snipers caused over 30% of the casualties. US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element* p. 1–31.

<sup>71</sup> Vick, *Aerospace Operations in Urban Environments*, pp. 107–110. See also, US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, pp. 5–84 to 5–87.

<sup>72</sup> Partridge, "Modifying the Abrams for Fighting in Urban Areas," *Amor* (July–August 2001): pp.19-24.

<sup>73</sup> Allan Vick et al., *Aerospace Operations in Urban Environments*, pp. 111–114. Another related concern is the ammunition selection for the M1 Abrams. Currently only sabot and HEAT rounds are available,

- ▶ A fourth limitation is response time. Many of the targets in the urban environment will be of a fleeting nature.<sup>74</sup> The cycle time between identification of the target and ordnance on target must be shorter.<sup>75</sup>
- ▶ Last but not least, fire support needs to be viable in all weather conditions and at night.

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both of which have limitations in urban terrain versus infantry targets. The armor-piercing darts used in the M829 series of rounds produces: small holes in walls, minimal spalling, and would over penetrate most targets. The current M830A1 HEAT round trades increased muzzle velocity for a decreased warhead size. This tradeoff improves its capability versus vehicle targets while reducing its capability against dismounted infantry. Currently lacking is canister-type round: one that is inexpensive, has no minimum range restrictions, and is very effective against infantry. The former commanding general of the US Army Armor Center called for just such a round. MajGen B. B. Bell, "Armor Branch's 'Way Ahead' Advances on Four Thrust Lines," *Armor* (July–August 2001): p. 6. A Marine Corps MOUT manual cited the following safe distances (0.1% chance of injury) for friendly personnel from these fire support weapons (assuming each system is firing at maximum range): 60mm mortar: 175m; 81mm mortar: 230m; 155mm: 450m. By raising the chance of injury to friendly personnel to 10%, those distances can be reduced to: 60mm mortar: 65m; 81mm mortar: 80m; 155mm: 125m. US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 5–89.

<sup>74</sup> For a description of how almost everything happens faster in MOUT, see Glenn, *Heavy Matter*, 10–11.

<sup>75</sup> Chechen forces in Grozny would conduct hit-and-run attacks with their own artillery that Russian forces had great difficulty reacting to. The Chechens would disperse before the Russian fire support system could respond. Maj. Gregory J. Celestan, "Red Storm: The Russian Artillery in Chechnya," pp. 42–45. A Joint Staff study found that fratricide would be a significant problem for urban indirect fire support unless GPS systems could maintain at least 14-meter CEPs with updates at least every 90 seconds. US Department of Defense, Joint Staff, *Military Operations in Urban Terrain C4I Study*, pp. 9–10.



## Consolidate

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### C1 Infrastructure management and repair capabilities.<sup>76</sup>

Grade: Fair

**Issue:** Currently, there is a substantial infrastructure repair and management capability. The difficulty comes in dealing with the sheer scale of support needed if combat operations were to take place in any large city. Approximately 77 of the world's cities have populations of three million or more.<sup>77</sup> With these larger cities a great deal of support, external to what a JTF could bring with it, would be needed. The amount of needed international and interagency support would be considerable. With even a medium-size (e.g., 400,000 population) city, the JTF alone would be woefully incapable of supporting the population by itself. Therefore, managing the local infrastructure will play a key role in supporting the civilian population.<sup>78</sup> Managing the local medical infrastructure would be especially critical in the case of WMD use in the city.

### C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.<sup>79</sup>

Grade: Poor:

The degree to which this requirement burdens the resources of the JTF will depend largely on the duration of the mission. If the urban mission is completed in a few days, then policing duties will have a very limited strain on the JTF. However, if the mission

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<sup>76</sup> Urban MOOTW will involve providing basic services to the population. US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, p. IV-25. "The Marine commander will face immediate requirements to provide what are by local standards minimum essential civil services (electricity, water, food, and public health)." US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 10-2.

<sup>77</sup> George Thomas Kurian, ed., *Illustrated Book of World Rankings* (Armonk, N.Y.: M. E. Sharpe, 1997), p. 343.

<sup>78</sup> According to a 2000 RAND report, failure to care for the civilian population would entail substantial political repercussions. Glenn, *Heavy Matter*, p. 14.

<sup>79</sup> "Military forces involved in the control of cities will soon find military operations becoming blurred with law enforcement and police activity." US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element*, p. 10-3.

continues for several weeks or even months, then this aspect of controlling the city will take on greater importance.<sup>80</sup>

**Issues:** The difficulty of reestablishing the rule of law is twofold. The first problem is the high manpower requirements for policing large areas with high population densities. In US cities, the average ratio of police officers to citizens is 3.1 to 1,000.<sup>81</sup> If US forces were in control of 50% of a city of two million, and wanted to match that ratio, it would require 3,100 troops (per shift). This function would require combat troops, troops that then would be unavailable for dealing with the Red force. Such a manpower strain would be very difficult for a JTF. Support from outside sources would likely be needed. The second problem is the judicial layer of the justice system—it may not be functional. In that case there would be no local authorities to hand criminals over to, forcing US forces to operate both ends of the justice pipeline. That would put an additional strain on JTF resources.<sup>82</sup> When operating in larger cities many of the possible scenarios could see the policing and justice system requirements exceeding what the JFC can spare for non-combat duties. This capability may, at least in part, require use of non-lethal barriers to control movement.

### **C3 The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure.<sup>83</sup>**

**Grade: Poor**

US forces already have a substantial capability to deal with the effects of WMD upon themselves.

**Issue:** The difficulty derives from extending that protection to the civilian population. While the technology is not especially challenging, the sheer scale involved is. Designing

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<sup>80</sup> US forces operating in Panama in 1989 were used to establish law and order because US civilian agencies were incapable of doing so. US Department of Defense, Joint Staff. *Handbook for Joint Urban Operaton*, p. IV–15. In an article describing operations in Panama City, Major Robert G. Boyko wrote, “Our mission was to secure the area from pro-Noriega forces and restore law and order—a mission for which none of us had ever trained.” Boyko, “Just Cause MOUT Lessons Learned, p. 28.

<sup>81</sup> Robert Famighetti, ed., *The World Almanac and Book of Facts 2000* (Mahwah, N.J.: Primedia, 1999), p. 905.

<sup>82</sup> The United Nations Internal Forces (IFOR) in Bosnia had just that problem. The local judicial system was dysfunctional and required substantial support from IFOR. Col. John J. Tuozzolo (USAR), “The Challenge of Civil-Military Operations,” *Joint Forces Quarterly* (Summer 1997): pp. 54–58.

<sup>83</sup> The *Handbook for Joint Urban Operations* mentions three times the need for the JFC to prepare for WMD use in the city. US Department of Defense, Joint Staff, *Handbook for Joint Urban Operations*, pp. EX–6, III–4, III–13.

and producing a suit to protect personnel from nerve agents has already been done; providing 800,000 of those suits on short notice is extremely difficult. Decontaminating a dozen M1A1 tanks is relatively easy; decontaminating a single 9-story/600-room hospital is not. Preparations can be aimed at stockpiling key supplies and coordinating with actors outside of the JTF. In the case of a WMD incident, aggressive implementation of well-thought-out plans, and the marshalling of all available resources could make the difference between 2,000 and 20,000 civilian dead. To build that type of capability will require the inclusion of WMD scenarios in urban exercises and practice in working across joint, interagency, coalition, local government, and NGO boundaries.



## **Appendix C. Summary of Urban Variable Impacts**



## Contents

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Sensitivity Grades.....	5
Understand.....	5
U1    ISR capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.....	5
U2    The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians. ....	6
U3    The ISR capability to discern Red movement patterns, logistical methods, and intentions for both. ....	7
US4    The ability to command, control and communicate with units operating in a discontinuous fashion when radio and GPS systems work poorly.....	8
UST5    Coordination capabilities across Service, agency, coalition partner, and NGO boundaries. ....	9
U6    The ISR capability to generate an in-depth understanding of the city's population and its likely future actions and reactions.....	9
U7    The ability to do urban BDA.....	10
U8    The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors.....	11
U9    Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red/Blue/White. ....	11
U10    The ability to detect/neutralize mines, booby traps, and toxic chemicals. ....	12
Shape .....	12
S1    The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces. ....	12
S2    The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas. ....	15
S3    Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.....	15
S6    Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city .....	17

S7	Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion. ....	18
S8	Capabilities to communicate with, coordinate with, and influence the local populace. ....	19
S9	The ability to mislead Red as to the movement and location of Blue forces in the city. ....	20
S10	Conduct small-unit combined arms operations. ....	21
S11	Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials. ....	21
S12	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat. ....	22
S13	The ability to selectively disable utility, transportation, and communication systems in a city for the short or long term. ....	22
S14	Improve infantry’s mobility over urban obstacles. ....	23
Engage	.....	23
E1	The ability to destroy wide area targets. ....	23
E2	The ability to destroy point targets with minimal collateral damage. ....	24
E3	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel. ....	25
E4	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings. ....	26
E5	Sniper and Counter-Sniper capabilities. ....	27
E6	Urban fire support. ....	28
Consolidate	.....	29
C1	Infrastructure management and repair capabilities. ....	29
C2	Capabilities to reestablish the rule of law in portions of the city under Blue control. ....	30
C3	The capabilities to mitigate the effects of WMD (weapons of mass destruction) use on urban civilian populations and infrastructure. ....	31



### Sensitivity Grades

**Low:** The capability is affected only minimally by changes in the variable.

**Medium:** The capability is affected moderately by changes in the variable.

**High:** The capability is severely affected by changes in the variable.

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### Understand

**U1 ISR capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** High. Any effort to discern the nodes of a city would require substantial HUMINT (human intelligence) resources. Without the cooperation of at least a portion of the populace, getting the level of detail needed would be very difficult. The local populace will possess a level of understanding unmatched by outside sources of information. Their level of understanding will also be more up-to-date than outside sources. The effectiveness of IMINT (imagery intelligence) and SIGINT (signal intelligence) would be greatly magnified if used in conjunction with HUMINT.<sup>1</sup>

**Local politics/culture/history:** High. Some societal structures are more diffuse and less hierarchical than what is commonly seen in the developed world. These societies possess less physical infrastructure and less formal political frameworks. Understanding these societies requires information of a very specific and up-to-date nature. The more obscure the local, the less preexisting expertise there will be available within the United States.

**Example:** US forces operating in Mogadishu had great difficulty in finding interpreters and experts in the local culture. The tribal nature of the cultural and political environment produced few clear lines of authority to influence. That

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<sup>1</sup> The *Handbook for Joint Urban Operations* states “Experience in JUO clearly demonstrates that HUMINT [human intelligence] is essential to understanding and communicating with the local population and to developing situational awareness.” US Department of Defense. Joint Staff, p. III-9.

may have effected the decision to target a local political and military figure, Mohamed Farrah Aidid, whom the locals viewed as one of their “nodes.”<sup>2</sup>

**Quality of joint/interagency/coalition/NGO interaction:** High. The wide range of information needed to understand the “texture” of a given city will come from a variety of sources. Those sources are going to belong to many different services, agencies, coalition partners, and NGOs (non-governmental organizations). Unless the Joint Task Force (JTF) has a good working relationship with these other partners, then much of that information will remain in stovepipes and never reach the Joint Force Commander (JFC). A five-person team from an NGO, which has been on the ground for the last two years, might be a JFC’s best source for information about a local political/cultural environment.<sup>3</sup>

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

## **U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. Monitoring all the potential hiding places in the complex terrain of a city will be very stressing on ISR (intelligence, surveillance, and reconnaissance) assets. A very large city could easily provide more hiding places than the JFC’s ISR assets can cover. A city with more underground passageways (e.g., subways, sewers, road tunnels) and large buildings would add another layer of difficulty.

**Location of the city:** Medium

**Attitude of the populace:** High. A substantial portion of the existing intelligence on Red force locations will reside with the local populace. If poor relations exist between the locals and the Blue force, then most of that information will be unavailable to the JFC. An unmanned aerial vehicle (UAV) may be able to detect an individual walking down the street, but a shopkeeper across the street can see that person *and* tell if that person is a local.

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<sup>2</sup> Mark Bowden, *Black Hawk Down*, (New York: Penguin Press, 1999), pp. 71–74.

<sup>3</sup> The *Handbook for Joint Urban Operations* called the sharing of intelligence between coalition forces “essential.” US Department of Defense, Joint Staff, p. III–26.

**Example:** In their 1975 Spring Offensive, the North Vietnamese Army used extensive networks of informers to prepare various cities for capture. These HUMINT sources would locate all of the defending units in the city as well as the command and control nodes.<sup>4</sup>

**Example:** In 1994—1995, the Brazilian military conducted operations against organized criminal elements in the slums of Rio de Janeiro. Great care was taken to respect the wishes of the civilians in those areas during the operation. As the operation progressed, the local population became more friendly and information about criminal hideouts began pouring in via a telephone hotline set up by the military.<sup>5</sup>

**Local politics/culture/history:** Medium

**Quality of joint/interagency/coalition interaction:** High. The information available on the location of Red forces will likely come from a variety of sources, only a portion of which the JFC will control. Those other sources are going to belong to many different services, agencies, coalition partners, and NGOs. Unless the JFC has a good working relationship with these other partners, much of that information will remain out of reach.

**Rules of Engagement:** Low

**Overall theater campaign schedule:** High. ISR assets are normally high-demand – low-density items. If the weight of the campaign effort were elsewhere in the theater while operations were proceeding against a city, the JFC commander would likely have insufficient ISR assets to work with.

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

### **U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Medium

**Location of the city:** Medium

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<sup>4</sup> LtCol R. W. Lamont, USMC, “Urban Warrior—A View from North Vietnam,” *Marine Corps Gazette* (April 1999):pp. 32–33.

<sup>5</sup> Col. William Mendel, US Army (ret.), “Operation Rio: Taking Back the Streets,” *Military Review* (May–June 1997).

**Attitude of the populace:** High. Acquiring knowledge at this level will require substantial input from HUMINT sources. The local populace is the single best source of HUMINT intelligence. They understand the local environment, they provide a “sensor net” that has excellent coverage of the city, and they can facilitate Blue’s own intelligence collection efforts in the city (e.g., cueing other ISR platforms). If they are overtly hostile to the Blue force, then getting intelligence about Red intentions would be much more difficult.

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** High. The various intelligence capabilities available are going to be spread across many services, agencies, coalition partners, and even NGOs. To produce an in-depth picture of how Red moves and supplies itself, and how it intends to in the future, those various intelligence capabilities must work together. No one source of information is going to have all the relevant data. The quality of cooperation will determine the quality of the overall intelligence product.

**Rules of Engagement: Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

**US4 The ability to command, control and communicate with units operating in a discontinuous fashion when radio and GPS systems work poorly.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. Tall buildings interfere considerably with radio transmissions and GPS (Global Positioning System) signals. A city with a greater number of large buildings is more problematic because the more time troops spend in buildings, the less contact they will have with command elements and the less the command elements know about the activities of the troops.

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Low

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

**UST5 Coordination capabilities across Service, agency, coalition partner, and NGO boundaries.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Low

**Location of the city:** Medium

**Attitude of the populace:** Medium

**Local politics/culture/history:** Medium

**Quality of joint/interagency/coalition/NGO interaction:** This particular variable is also a capability. How well this particular capability is exercised influences many other capabilities.

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Low

**Level of threat:** Low

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

**U6 The ISR capability to generate an in-depth understanding of the city's population and its likely future actions and reactions.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Low

**Location of the city:** Low

**Attitude of the populace:** High. Inserting HUMINT assets and recruiting HUMINT assets within the city will both be very difficult if the population is hostile.<sup>6</sup>

**Local politics/culture/history:** Medium

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<sup>6</sup> Brazilian forces operating against organized criminal elements in the slums of Rio de Janeiro in 1994–1995 found the local populace to be an excellent source of intelligence. However, only later in the operation after the military had taken great pains to be considerate of the civilians, did the local population begin supplying information. Mendel, “Operation Rio.”

**Quality of joint/interagency/coalition/NGO interaction:** High. The sources of information on the population will be spread across a wide range of sources. Accessing those sources quickly and efficiently will depend on how smoothly the various components of the force work together. HUMINT resources will likewise be spread across the force.<sup>7</sup>

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Medium

**Level of threat:** Low

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

## **U7 The ability to do urban BDA.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. The larger the city the greater the number of infrastructure targets. Strikes on those targets will require BDA (Battle Damage Assessment), often to evaluate non-lethal and non-kinetic effects. A larger and more modern city will also have more large buildings and more underground structures. The effects of attacks on these locations will further stress BDA capabilities.

**Location of the city:** Low

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Low

**Overall theater campaign schedule:** High. Because BDA is likely to be an ISR-intensive activity those assets must be available to the JFC. If other priorities in the theater draw away those scarce assets, then the quality of BDA will suffer.

**Level of threat:** High. Because a large portion of the ISR capability resides on airborne platforms any foe possessing advanced SAM (surface-to-air missile) systems (e.g., Mistral, RBS 15, SA-10, SA-15) could attrite those scarce assets.

**Red political will:** Low

**Red force morale:** Low

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<sup>7</sup> *Joint Vision 2020* states “All organizations have unique information assets that can contribute to the common relevant operational picture and support unified action.” US Department of Defense, Chairman, Joint Chiefs of Staff, pp. 24–25.

**Blue political will:** Low

**U8 The ISR ability to rapidly generate 3D, small-scale, up to date, digital maps of the urban battlespace that include subterranean features and possibly building interiors.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. A large city with many taller buildings would be much more challenging to model on short notice by surging ISR assets. Maintaining a current data-base on such a large city would also be taxing.

**Location of the city:** Medium

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Low

**Overall theater campaign schedule:** High. If the 3D mapping capability rests on the ability to surge ISR assets, those assets might be unavailable if other missions within the theater are given greater emphasis.

**Level of threat:** High. A Red force equipped with sophisticated SAMs (SA-10/12) could attrite much of the ISR capability residing in airborne platforms.

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

**U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red/Blue/White.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Low

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

**Level of threat:** Low

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

**U10 The ability to detect/neutralize mines, booby traps, and toxic chemicals.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Low

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Low

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

## **Shape**

**S1 The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.**

**Terrain/Climate/Weather:** High. Areas of dense foliage provide cover from many of the sensors used by US forces. Rough terrain also breaks up the line-of-sight for most types of sensors (visual, radar, thermal), creating channels for hidden movement. Interdicting the flow of supplies and reinforcements can then be very difficult unless troops are closely spaced all along the axes of approach. Poor weather can interfere with optical sensors on airborne ISR platforms, and in some cases restrict flight operations.

**Example:** US forces had great difficulty in interdicting foot and truck traffic along the Ho Chi Minh Trail. A 1996 Rand report cites today's USAF capabilities against infantry targets in dense foliage, rugged terrain, or urban areas as not



significantly better than those during operations in Vietnam.<sup>8</sup> Additionally, if the Red force is mostly light infantry, then its logistical needs will be modest and the needed supplies primarily “man-packable.”

**City, size, and type:** High. The mega-cities present around the world today cover very large areas. Placing an extended perimeter around a large city would require a large force with extensive ISR assets.

**Example:** *The Illustrated Book of World Rankings* lists 31 world cities over 200 square miles in area.<sup>9</sup> A city, shaped like a circle, with a 200 square mile area would have a 50-mile perimeter. A general rule of thumb is that one battalion can cover 3 kilometers of front. For a 50-mile perimeter, that translates into about three divisions assigned to guard duty and unavailable for operations inside the city.

**Example:** The Russians initially failed to seal off Grozny in 1995 and supplies and reinforcements flowed into the Chechen defenders. In 2000 the Russians devoted approximately 50,000 troops just to sealing off the city.<sup>10</sup>

**Location of the city:** High. The geographic location of a city can make it either very resistant or very vulnerable to blockade. A city near an international border might be especially difficult blockade because interdiction efforts may not be allowed across the border. The same would be true of a city located at the hub of many railroads and highways. A city on an island could be especially vulnerable to a US naval blockade.

**Example:** In 1942 the British stronghold of Singapore was fairly easy for the Japanese to isolate. The Japanese were marching down the only land access route while their fleets and air power controlled the ocean approaches.<sup>11</sup>

**Example:** In World War II both Stalingrad and Leningrad remained at least partially supplied throughout the attacks on them. This was in part because both cities were accessible via water, one by river and the other by a lake. Lake Ladoga was a conduit for supplies to Leningrad off and on throughout the

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<sup>8</sup> Alan Vick et al., *Enhancing Air Power's Contribution Against Light Infantry Targets* (Santa Monica, CA: Rand, 1996), p. 3.

<sup>9</sup> George Thomas Kurian, ed., *Illustrated Book of World Rankings* (Armonk, N.Y.: M. E. Sharpe, 1997), p. 342.

<sup>10</sup> Timothy L. Thomas, “Grozny 2000: Urban Combat Lessons Learned.” *Military Review* (July-August 2000): pp. 50-58. See also Lester W. Grau, “Russian Urban Tactics: Lessons from the Battle for Grozny,” *INSS Strategic Forum* (July 1995).

<sup>11</sup> Williamson Murray and Allan R. Millett, *A War to be Won* (Cambridge, Mass.: Belknap Press, 2000), pp. 179–181.

three-year siege. The Volga River made it difficult for the Germans to encircle and cutoff supplies into Stalingrad.<sup>12</sup>

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** High. Sealing off a medium to large size city is a resource-intensive endeavor. That likely translates into the pooling of resources by different Services and coalition partners. If the coordination between Services and coalition partners is poor, leaks are likely to develop in the seal around the city.

**Rules of Engagement:** High. A blockade derives its effectiveness from (1) physically blocking people and vehicles from crossing a piece of ground, and (2) threatening people and vehicles crossing an announced line on the map with attack from a distance. Blue will not actually have forces or physical barriers covering every meter of the perimeter. The threat of ranged attack will be relied upon to close the gaps. But if the ROE (Rules of Engagement) are very strict and do not allow attacks on people/ and vehicles of unknown identity who refuse orders to stop, then those gaps will leak. Red will quickly discover the limits placed on Blue by Blue's own ROE and will exploit them.<sup>13</sup>

**Example:** The effectiveness of the Peruvian military in stopping narcotics smuggling flights across its airspace increased dramatically in the mid-1990s when new ROE allowed shooting down aircraft that refused orders to land.<sup>14</sup>

**Overall theater campaign schedule:** Medium

**Level of threat:** High. The degree to which the isolated Red forces can pose a threat to the blockading forces will affect how Blue forces operate. The greater the threat, the greater the proportion of Blue efforts going into force protection, and the less effort into actually sealing off the perimeter. A high threat level (e.g., a Red force equipped with heavy artillery) could also force Blue forces to form their cordon at some standoff distance from the city's edge. This would substantially increase the length of the perimeter.

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<sup>12</sup> Murray and Millett, *A War to be Won*, pp. 130–131, 283–284. Roger J. Spiller, *Sharp Corners: Urban Operations at Century's End*, (Ft. Leavenworth, Kansas: US Army Command and Staff College Press, 2000), pp. 60–61. Harrison E. Salisbury, *The 900 Days: the Siege of Leningrad* (New York: Harper and Row, 1969).

<sup>13</sup> "The enemy will determine what is and what is not permitted within your ROE over time and continuous observation. In return, they will use ROE against us, by provoking Marine forces to the limits of the ROE." US Marine Corps, Marine Aviation Weapons and Tactics Squadron One, *Aviation Combat Element: Military Operations on Urban Terrain Manual*. (Yuma, AZ.: Marine Aviation Weapons and Tactics Squadron One, March 1999), p. 1–36.

<sup>14</sup> John Chipman, ed., *Strategic Survey 1997/98* (London: International Institute for Strategic Studies, 1998), p. 88.

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

**S2 The ability to maintain a secure front line within the city to prevent enemy movement into cleared areas.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. The density of urban terrain provides a great deal of cover to any forces wishing to slip through an opponent's front line. This then requires the opponent force to pack its units very tightly to close all possible gaps. Because most of today's sensor technology is line-of-sight, and the urban environment is characterized by short lines-of-sight, current sensor inventories are likely to be insufficient. Until some advances in sensors are made (in cost, size, autonomous operation, and line-of-sight limitations), the Mark One Eyeball will be the sensor of choice. The problem is that with a large-sized city (e.g., 10 miles across), populating that front line with a high density of troops becomes very resource intensive.

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Medium

**Red force morale:** Medium

**Blue political will:** High. Providing the substantial forces needed to adequately seal off a large portion of a city from the Red force will require substantial political will. If an operation were considered only "worthy" of a few battalions of infantry, then it would prove impossible to seal off any sizable portion of even a medium-sized city.

**S3 Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. The ability of Red to move about the city would be substantially affected by the city transportation infrastructure and the amount of cover afforded by foliage and structures. Any city with extensive highway and/or subway networks would be mobility friendly. Additionally, a large city would simply provide more place to move to for Red movement, thus complicating Blue's countermobility efforts.

**Location of the city:** Low

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** High. Any comprehensive counter-mobility effort across a city would require substantial ISR, standoff strike, and barrier assets. The different Services and coalition partners will need to be coordinated by the JFC because these assets will be spread among them. If one Service's ISR assets do not integrate with another Service's standoff strike units, then the counter-mobility effort will (at best) be only partially successful. Information Operations (IO) will require coordination between all the parties involved for two reasons. First, the assets required to conduct IO will likely be spread across several Services/agencies/coalition/NGO partners so grouping those assets together will be required. The second reason is that without some de-confliction efforts, the various IO efforts could undermine each other.<sup>15</sup>

**Rules of Engagement:** High. The Red vehicles and individuals moving about the city will not always be clearly labeled as such. That will require some "best guesses" to be made about when and when not to shoot at these fleeting targets. If the ROE are especially restrictive a substantial portion of Red movement may go unhindered. The ROE will also play in what types of barrier technologies are used. Lethal means like mines might not be allowed. While razor-wire barriers are less likely (than mines) to injure innocent civilians, they are also easier to breach. Any future use of non-lethal means of counter-mobility would be highly sensitive to ROE and policy questions. ROE and policy questions would also factor heavily in the use of information operations. Concern about the effects of IO spilling over into civilian information systems would affect IO designed to disrupt Red C<sup>3</sup> and disrupt/distort Red's intelligence gathering.

**Overall theater campaign schedule:** High. Any comprehensive counter-mobility effort across a city would require substantial ISR, standoff strike, and barrier assets. These are all elements of the overall theater effort, and could be in high demand elsewhere in the theater. ISR assets especially are likely to be concentrated only at the point of greatest effort. If a given city is not where the weight of effort is being focused in a theater, then the ISR assets needed for a comprehensive counter-mobility effort will not be

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<sup>15</sup> For a description of countermobility's role in Dominate Maneuver and the need for the future joint force to engage in Dominate Maneuver with all potential partners, see US Department of Defense, Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, pp. 26–28.

available. Conversely, if a given city were made a high priority for the overall theater campaign, then the tempo of operations might not allow time for a SEAD (Suppression of Enemy Air Defenses) effort to be completed before airborne ISR assets were used near the city. This could result in substantially higher losses of low-density – high-demand platforms (e.g., J-STARS, U-2, Global Hawk) in the early part of the operation. Information Operations may also require certain low-density – high-demand assets (e.g., EC-130, RC-135, EP-3) whose availability would depend on demand elsewhere in the theater.

**Level of threat:** High. A large portion of the ISR assets used to detect Red movement patterns will be airborne platforms. Those platforms would be vulnerable to a Red force equipped with sophisticated air defenses. A Red force with Russian-made SA-10s could place at risk any manned or unmanned ISR airborne platform currently in the US inventory. If airborne ISR assets were forced to operate at longer standoff ranges, they would miss many of Red's movements in the crevasses of the urban canyons.

**Red political will:** Medium

**Red force morale:** Medium

**Blue political will:** High. The overall level of forces required to conduct comprehensive counter-mobility effort is high. ISR assets in particular would be required in large numbers. Unless the US national command authorities deem a particular city very important, the allocation of forces to conduct a counter-mobility effort would not be forthcoming. In conducting IO aimed at Red's command, control, communications, and intelligence (C3I) efforts, there would be concerns about the effects of those efforts spilling over into the civilian sector. The high density of media outlets likely in the urban environment would aggravate the spillover effect. The military utility of these actions would have to be weighed against the risks of informational collateral damage.

## **S6 Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Medium

**Location of the city:** Medium

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Medium

**Level of threat:** High. A Red force with modern air defenses (ZSU-23-4, 2S6M, Mistral, SA-15, SA-18) could seriously attrite helicopter transports attempting to fly across Red

held territory. A Red force with substantial anti-tank weaponry (Milan, BILL, AT-13, AT-14) or its own armor could inflict heavy losses on an armored column attempting to transit unsecured territory. Unlike an “RPG-only” force<sup>16</sup>, this force could place US heavy armor at greater risk. Light armor could be attacked from greater ranges, provided the lines of sight were available.

**Red political will:** Low

**Red force morale:** High. Even a modestly equipped Red force, if willing to ignore losses and press ahead forcefully with attacks, could seriously attrite Blue units.

**Example:** With light weapons and little fear, the Somalis managed to bring down four MH-60 Black Hawk helicopters and kill 18 US personnel from elite units in just one day.<sup>17</sup>

**Example:** In 1993 US forces in Mogadishu had great difficulty conducting ground and air resupply of isolated forces.<sup>18</sup>

**Example:** In 1995 Russian forces had major problems reinforcing their units caught in Grozny.<sup>19</sup>

**Blue political will:** Medium

## **S7 Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Low

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<sup>16</sup> Rocket-propelled grenade.

<sup>17</sup> Bowden, *Black Hawk Down*, pp. 110, 333.

<sup>18</sup> Bowden, *Black Hawk Down*, pp. 25–131, 231.

<sup>19</sup> Lester W. Grau and Timothy L. Thomas, “‘Soft Log’ and Concrete Canyons: Russian Urban Combat Logistics in Grozny,” *Marine Corps Gazette* (October 1999): pp. 67–75. Lester W. Grau and Dr. William A Jorgensen, D.O., “Handling the Wounded in a Counter-Guerrilla War: The Soviet/Russian Experience In Afghanistan and Chechnya,” *US Army Medical Department Journal* (January–February 1998).

**Level of threat:** High. The greater the reach of Red's weapon systems, and the better the quality of Red reconnaissance, the greater the threat to Blue CSS (Combat Service Support) elements (e.g., logistics, medical) near the front line. A pairing of UAVs and mortars could be very effective in the anti-CSS role.

**Red political will:** Low

**Red force morale:** Medium

**Blue political will:** Low

## **S8 Capabilities to communicate with, coordinate with, and influence the local populace.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Low

**Location of the city:** Low

**Attitude of the populace:** High. A hostile populace is unlikely to take direction of any kind from Blue. A friendly populace is likely to be more trusting of any information and requests from the Blue force.

**Local politics/culture/history:** High. The political and historical context of a city may make its populace averse to trusting any form of authority. In a failed Third World state, the local population may not believe it even possible for a governmental type authority to provide adequate shelter, food, and medical care because they had never previously seen that demonstrated.

**Example:** The local population of Mogadishu identified more with clans than with any central governmental authority. When US forces took actions against what the United States saw as renegade forces, the locals saw it as a threat to legitimate authority.<sup>20</sup>

**Quality of joint/interagency/coalition/NGO interaction:** High. The ability to support large numbers of civilians (e.g., several hundred thousand) away from their homes will be beyond the capabilities of the JTF. Civilians who remain inside the city will also require some assistance as the city's infrastructure is likely to be disrupted. The other agencies, coalition partners, and NGOs would have to assist. If that assistance cannot be organized, international political costs could be substantial and the local population could turn hostile. The overall game plan for dealing with the population can also be damaged by insufficient unity of effort by all the agencies and coalition partners involved.

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<sup>20</sup> Bowden, *Black Hawk Down*, pp. 71–76.



**Example:** Some coalition troops in Somalia were suspected of tipping off the Somalis about US raids in Mogadishu.<sup>21</sup>

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Low

**Level of threat:** Low

**Red political will:** Medium

**Red force morale:** Medium

**Blue political will:** Low

**S9 The ability to mislead Red as to the movement and location of Blue forces in the city.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** High. A hostile populace would constantly leak information to the Red force. Such a HUMINT resource for Red would be almost impossible to neutralize.

**Example:** Soviet forces in Afghanistan found it nearly impossible to surprise their Mujaheddin foes. The rebels benefited from an extensive network of friendly civilian informants.<sup>22</sup>

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Low

**Level of threat:** Low

**Red political will:** Medium

**Red force morale:** Low

**Blue political will:** Medium

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<sup>21</sup> Bowden, *Black Hawk Down*, pp. 97, 206.

<sup>22</sup> Ali A. Jalali, and Lester W. Grau, "Night Stalkers and the Mean Streets: Afghan Urban Guerrillas," *Infantry* (January–April 1999): pp. 20–26.



**S10 Conduct small-unit combined arms operations.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** High. No one Service is going to possess all of the various needed components in the needed proportions. The mixing and matching of infantry, artillery, armor, and other components across Service (and possibly coalition) boundaries will be necessary for small-unit combined arms to work.

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Low

**Level of threat:** Low

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

**S11 Medical capabilities to protect Blue personnel from disease, psychological threats, and hazardous materials.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. A city with poor sanitation, significant industrial pollution, minimal medical facilities, and a high population density would be especially hazardous to US personnel.

**Location of the city:** High. Cities located in tropical climates would pose the greatest difficulty. Warmth and moisture would facilitate bacterial growth and the local tropical diseases would be unfamiliar to the immune systems of US personnel. If the city were located near sources of water (e.g., rivers, lakes, swamps), insect-borne diseases could be a major problem.

**Attitude of the populace:** Low

**Local politics/culture/history:** Medium

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Medium

**Red force morale:** Low

**Blue political will:** Low

**S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Low

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

**Level of threat:** Low

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

**S13 The ability to selectively disable utility, transportation, and communication systems in a city for the short or long term.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Low

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** High. Attacking civilian infrastructure is likely to be a very sensitive issue. The specific systems that can be targeted, and the extent to which they can be disabled, will all depend on the ROE. There will be concerns about the military and civilian infrastructure interconnectivity and the spill over of effects across international borders.

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

#### **S14 Improve infantry's mobility over urban obstacles.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** High. High-rise reinforced concrete structures would present a much more challenging mobility environment. Walls would be more difficult to breach and taller buildings would be challenging to scale (e.g., increased exposure time outside).

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Low

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Low

### **Engage**

#### **E1 The ability to destroy wide area targets.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** High. The majority of scenarios will severely limit the acceptable collateral damage and civilian casualty levels. The ability to inflict this type of wide-scale destruction would be dependent on the JFC having unusually liberal ROE.

**Example:** Only precision-guided munitions (PGMs) were approved for use against targets in Baghdad during the Gulf War.<sup>23</sup>

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Medium

**Red force morale:** Low

**Blue political will:** High. The levels of collateral damage and civilian deaths would be high if this capability were employed. The international and domestic political costs would therefore also be high. The national command authorities would then have to be willing to bear those considerable costs before they would give a green light to destroying wide-area targets in a city. In recent US history, that level of political will has not been forthcoming.

**Example:** Despite severe criticism from Europe for the heavy-handed use of firepower in Grozny, Moscow's political leadership continue to give the Russian military a free hand.<sup>24</sup>

## **E2 The ability to destroy point targets with minimal collateral damage.**

**Terrain/Climate/Weather:** High. Heavy cloud cover and dense vegetation can interfere with target designation for many PGMs.

**Example:** The efficacy of PGMs in the Gulf War contrasted greatly with their effectiveness in Kosovo. Low cloud cover and forests impeded laser-guided bomb use, a staple of the US PGM inventory. Only a small portion of the PGM inventory (e.g., JDAM (Joint Direct Attack Munition), TLAM, CALCM (Conventional Air Launched Cruise Missile)) could circumvent these limitations by using GPS guidance.<sup>25</sup>

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** Low

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<sup>23</sup> Richard P. Hallion, *Storm Over Iraq* (Washington: Smithsonian Press, 1992), p. 169.

<sup>24</sup> Thomas, "Grozny 2000: Urban Combat Lessons Learned," pp. 50–51. "One of the fundamental differences between the two military campaigns in Chechnya in the 1990s has been, for want of a better phrase, the political will. In 1999, Russia had a leader (Putin) who, rightly or wrongly, wanted to prosecute this war with the utmost vigor." Anne Aldis, ed., *The Second Chechen War*, Occasional Paper No. 40, (Shrivenham, U.K.: Strategic and Combat Studies Institute, 2000), p. 56. For further details on international criticism of Russian actions, see also Aldis, *The Second Chechen War*, pp. 126–137.

<sup>25</sup> US Department of Defense, *Report to Congress: Kosovo/Operation Allied Force After-Action Report* (Washington: Government Printing Office, 2000), p. 86.

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** Medium

**Red force morale:** Low

**Blue political will:** Medium

**E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** High. Clearing buildings takes time, substantial forces, and results in friendly and civilian casualties. If a city is large, clearing even 10% of its buildings could prove too costly.<sup>26</sup>

**Example:** In 1982 the Israelis had their invasion timetables disrupted when they cleared Palestine Liberation Organization (PLO) forces from the Lebanon cities of Tyre and Sidon. The effort to drive PLO forces out of Beirut dragged on for three months and still did not result in the destruction of the PLO forces.<sup>27</sup>

**Example:** The Germans took three weeks to put down the 1943 Warsaw uprising and lost 300 KIA (Killed in Action). The 1944 uprising took even longer and was more costly, diverting badly needed forces from stopping the Soviet advance.<sup>28</sup>

**Location of the city:** Low

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** High. Clearing buildings involves combat at very close ranges. If Blue forces are required to adhere to numerous restrictions about when they can shoot,

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<sup>26</sup> According to the range manager at a Ft. Knox MOUT training facility, one three-story building (with 45 rooms) at the site can “eat up one whole company” to clear. Roxana Tiron, “Army Training Site Brings to Life the Horrors of War,” *National Defense* (July 2001): p. 20.

<sup>27</sup> Capt. James D. Leaf, “MOUT and the 1982 Lebanon Campaign: The Israeli Approach,” *Armor* (July-August 2000): pp. 8-11.

<sup>28</sup> Martin Gilbert, *The Second World War* (New York: Henry Holt and Company, 1989), p. 421.

and how much firepower can be used, Blue force losses could rapidly escalate. Another cost of restrictive ROE would be time. Given the very large number of rooms that would need clearing in just one large building, even a 10-second-per-room delay imposed by restrictive ROE could substantially bog down Blue operations.

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** High. Room-to-room fighting would be costly to both Red and Blue. The Red leadership would have to be willing to tolerate those losses before it could order its troops to hold every building.

**Example:** The Soviet leadership was highly motivated to hold onto Stalingrad at all costs. Without that political will the orders to hold every square inch of the city would not have been forthcoming.<sup>29</sup> That decision may have been influenced by the symbolic name of the city, or because it offered a chance to bleed the Germany Army white, or because the city was a key transportation hub to the rich resources of the Caucasus.

**Red force morale:** High. Room-to-room fighting is extremely stressing for the troops involved. Only the most motivated forces can perform this function for any significant length of time.

**Example:** Despite extremely heavy losses, with more than 300,000 killed, the Soviet forces storming Berlin in 1945 pressed on. Their desire to end the war and extract revenge provided powerful motivation.<sup>30</sup>

**Blue political will:** High. Clearing buildings is likely to be at least moderately costly for the attacking force. If the Blue political leadership exhibits less political will (e.g., a zero-casualty policy) then it is unlikely to authorize significant building-clearing operations.<sup>31</sup>

#### **E4 Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** Medium

**Location of the city:** Low

**Attitude of the populace:** Medium

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<sup>29</sup> Murray and Millett, *A War to be Won*, p. 282.

<sup>30</sup> Murray and Millett, *A War to be Won*, p. 482. Another source lists Russian losses as 100,000 killed: Cornelius Ryan, *The Last Battle: The Classic History of the Battle for Berlin*, (New York: Simon and Schuster, 1966), p. 520.

<sup>31</sup> The “aviation only” approach taken to Kosovo is a recent example. Building clearing operations were not possible because no ground troops were authorized to participate in the operation.

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** High. The policy aspects of using non-lethals have still to be worked out. For example, a device designed to be non-lethal might cause some form of permanent injury or death to 0.2% of those it is used on. That might then be sufficient to generate ROE precluding its use. Until some form of policy consensus is reached on what constitutes an acceptable risk in the use of non-lethals, there remains the potential of very restrictive ROE on their use.<sup>32</sup> Ironically, that could then lead to the use of lethal force as a substitute.

**Overall theater campaign schedule:** Low

**Level of threat:** Medium

**Red political will:** Medium

**Red force morale:** Medium

**Blue political will:** Medium

## **E5 Sniper and Counter-Sniper capabilities.**

**Terrain/Climate/Weather:** High. The topography of the city will be a basic determinate in how effective snipers are. A city on largely flat ground will provide fewer locations from which a sniper can cover large areas. Without height a sniper's field of view is cluttered by the city's structures.

**Example:** Serb forces held the high ground in Sarajevo and were able to make any movement over large sections of the city very hazardous.<sup>33</sup>

**City, size, and type:** High. A city with a large number of taller buildings provides the two elements most needed by snipers, cover and line-of-sight. The greater the number of potential sniper hides, the more difficult the counter-sniper mission is.

**Example:** The many tall buildings in Sarajevo provided Serb snipers with a wealth of height and cover.<sup>34</sup>

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<sup>32</sup> The Joint Non-Lethal Weapons Directorate has recommended that the Office of the Secretary of Defense, the Joint Staff, and other government agencies coordinate a review of policy on the use of non-lethal weapons. It also called for those policies to be changed where appropriate to allow for the early use of non-lethal capabilities in a preclusionary role. US Department of Defense, Joint Non-Lethal Weapons Directorate, *Non-Lethal Weapons Joint Mission Area Analysis/Joint Mission Need Analysis: Final Report*, (Washington, D.C.: US Government Printing Office, December 2000): vi. The fifth General Obligation under Article I of the Chemical Weapons Convention states "Each State Party undertakes not to use riot control agents as a method of warfare."

<sup>33</sup> Adrian Gilbert, *Stalk and Kill* (New York: St. Martin's Press, 1997), pp. 230–234.

<sup>34</sup> Gilbert, *Stalk and Kill*, pp. 230–234.

**Location of the city:** Low

**Attitude of the populace:** High. A sniper relies on stealth to accomplish his or her mission. Because the local populace is so familiar with the local terrain, and because they are widely dispersed throughout the city, they can be an effective “sensor” for detecting snipers. The side that then has the sympathies of the populace has a much easier counter-sniper mission.

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** Medium

**Overall theater campaign schedule:** Medium

**Level of threat:** Low

**Red political will:** Low

**Red force morale:** Medium

**Blue political will:** Medium

## **E6 Urban fire support.**

**Terrain/Climate/Weather:** Medium

**City, size, and type:** High. Cities with a large number of taller buildings (e.g., more than five floors) present a much more challenging fire support problem. Taller buildings can block the flight paths of incoming munitions. The density of the structures also plays a role.

**Location of the city:** Low

**Attitude of the populace:** Low

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** Low

**Rules of Engagement:** High. Concerns about collateral damage and civilian casualties will set the parameters for fire support use. Under strict ROE a large number of today’s systems could not be used.

**Example:** US forces have often gone into urban conflicts with strict limitations on the use of fire support. However, those limitations have usually been lifted as casualties mounted. That pattern was seen in Manila in 1945, Seoul in 1950, and Hue City in 1968.<sup>35</sup>

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<sup>35</sup> Capt. Kevin W. Brown, “The Urban Warfare Dilemma—U.S. Casualties vs. Collateral Damage,” *Marine Corps Gazette* (January 1997): pp. 38–40.



**Overall theater campaign schedule:** Low

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

## **Consolidate**

### **C1 Infrastructure management and repair capabilities.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** High. The amount of infrastructure in need of repair will be directly related to the total amount of infrastructure in the city. A large modern city would have a tremendous amount of infrastructure that might need repair and/or management. A larger city could easily overwhelm the repair and management capabilities of a JTF.

**Example:** The city of Boston has its own rail and subway system, three underwater tunnels, a port, 12 TV stations, 21 radio stations, and 31 hospitals.<sup>36</sup>

**Location of the city:** Low

**Attitude of the populace:** Medium

**Local politics/culture/history:** Low

**Quality of joint/interagency/coalition/NGO interaction:** High. The scale of most urban infrastructure repair and management efforts will require the use of assets outside of the JTF. To fully tap that external expertise and capability, the JTF will need to communicate and coordinate with those external sources.

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

**Level of threat:** Medium

**Red political will:** High. If the Red political command authority was desperate enough, it might issue “scorched earth” orders to a losing Red force. That could dramatically increase the amount of infrastructure in need of repair.

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<sup>36</sup> Famighetti, Robert, ed., *The World Almanac and Book of Facts 2000*, (Mahwah, N.J.: Primedia, 1999), p. 447.

**Example:** In 1945 Hitler ordered most of Germany's infrastructure destroyed so as to deny it to the advanced allied armies. Fortunately for Germany, the order was largely ignored by German forces.<sup>37</sup>

**Example:** In 1991 Saddam Hussein ordered hundreds of Kuwaiti oil wells destroyed when the military situation began to look grim. A massive international effort took over nine months just to extinguish all the burning wells.<sup>38</sup>

**Red force morale:** Medium

**Blue political will:** Medium

## **C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.**

**Terrain/Climate/Weather:** Low

**City, size, and type:** High. The task of policing a city is manpower intensive. A large city could easily require more forces for this task than the JFC can spare.

**Example:** US cities average 3,100 police per one million population.<sup>39</sup>

**Location of the city:** Low

**Attitude of the populace:** High. The single greatest variable in keeping the peace will be the level of cooperation from the local populace. Without that cooperation, the task will require a much larger policing force.

**Local politics/culture/history:** High. Some cities will have a history involving little rule of law. The infrastructure may never have been in place or it may have been lost during the conflict. Taking such a city and suddenly imposing civic peace, via an external military force, would prove very difficult.

**Example:** Policing the various villages and towns of Bosnia proved difficult for IFOR (the United Nations International Force) because the judicial infrastructure was in disarray.<sup>40</sup>

**Quality of joint/interagency/coalition/NGO interaction:** Medium

**Rules of Engagement:** Low

**Overall theater campaign schedule:** Medium

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<sup>37</sup> William L. Shirer, *The Rise and Fall of the Third Reich* (New York: Ballantine, 1950), p. 1,432.

<sup>38</sup> Rick Atkinson, *Crusade* (New York: Houghton Mifflin, 1993), p. 492.

<sup>39</sup> Famighetti, *The World Almanac and Book of Facts 2000* p. 905.

<sup>40</sup> Col. John J. Tuozzolo, USAR, "The Challenge of Civil-Military Operations." *Joint Forces Quarterly* (Summer 1997): pp. 54–58.

**Level of threat:** Medium

**Red political will:** Low

**Red force morale:** Low

**Blue political will:** Medium

**C3 The capabilities to mitigate the effects of WMD (weapons of mass destruction) use on urban civilian populations and infrastructure.**

**Terrain/Climate/Weather:** High. The particular weather patterns of a given city could make it much more difficult to do damage control after a chemical-biological or nuclear event. Strong prevailing winds could create major cleanup and containment problems. For nuclear fallout, rainfall patterns could create high concentrations of radioactivity in parts of a city.

**City, size, and type:** High. Dealing with extensive decontamination efforts and feeding, housing, and treating masses of people will be a resource-intensive endeavor. The physical size of the city (in square miles) and the size of its population will be basic determinates of the workload involved in dealing with, or preparing for, a WMD incident.

**Location of the city:** Low

**Attitude of the populace:** Medium

**Local politics/culture/history:** Medium

**Quality of joint/interagency/coalition/NGO interaction:** High. Dealing with extensive decontamination efforts and feeding, housing, and treating masses of people will be a resource-intensive endeavor. The JTF itself is unlikely to possess all the needed resources. A wide range of coordination between all the parties involved will be required if the difficult task of dealing with, or preparing for, a WMD incident is to succeed.

**Rules of Engagement:** Low

**Overall theater campaign schedule:** High. Dealing with extensive decontamination efforts and feeding, housing, and treating masses of people will be a resource-intensive endeavor. If a particular city were considered a “side show” from the greater effort elsewhere in the theater, then the resources required for WMD preparations or consequence management might not be available.

**Level of threat:** Medium

**Red political will:** Medium

**Red force morale:** Low

**Blue political will:** Medium



## **Appendix D. Remaining Missions and Related Operational Concepts**

## Contents

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Defend a City .....	D-4
Isolate/Neutralize a City .....	D-5
Destroy/Capture an Enemy Force .....	D-6
Focused Offensive .....	D-6
Focused Defensive .....	D-7
Neutralize Combatants .....	D-7
Humanitarian Assistance .....	D-8
Civil Support in the United States .....	D-8
Capabilities Needed for the Two Additional Operational Concepts .....	D-9

## Illustrations

---

Figure D-1. Types of Operational Concepts (CAPTURE AN URBAN AREA) .....	D-3
Figure D-2. Summary of Operational Concepts Not Addressed Under Capture an Urban Area .....	D-9
Table D-1. Types of Urban Missions .....	D-3

This section looks at the other missions (besides CAPTURE AN URBAN AREA) and identifies operational concepts that a joint force commander (JFC) might use for each. In analyzing the CAPTURE AN URBAN AREA mission, we identified operational concepts *and* the capabilities needed for each. The focus here is mainly on **operational concepts**.

In addition to the concepts already covered in Chapter II, two additional operational concepts are added: **Urban Fortress**, discussed on page D-4; and **Infrastructure Augmentation**, discussed on pages D-8 and D-9. (Figure D-2 presents a summary of these two concepts.) The capabilities needed for these new operational concepts are discussed at the end of this appendix (page D-9). The graphics depicting the original operational concepts and the types of missions are repeated here for the convenience of the reader.

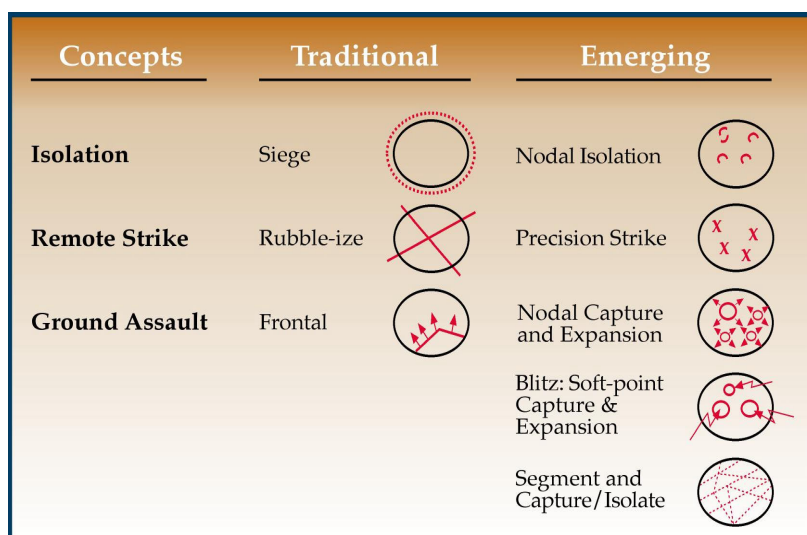


Figure D-1. Types of Operational Concepts (CAPTURE AN URBAN AREA)

Table D-1. Types of Urban Missions

Objective is the urban area itself:

- ▶ Capture
- ▶ Defend
- ▶ Isolate/neutralize

Objective is within an urban area:

- ▶ Neutralize an enemy force
- ▶ Conduct focused offense (e.g., against a facility; includes generation of "effects" against utilities, information, mobility)
- ▶ Conduct focused defense (e.g., create a sanctuary or conduct a rescue operation)

Objective is to protect or assist people in an urban area:

- ▶ Neutralize combatants (e.g., peace operation)
- ▶ Provide humanitarian assistance
- ▶ Provide civil support in the United States

## Defend a City

This mission would entail the defense of an entire urban area from external attack. It assumes the Blue force either already controls the city or can enter the city prior to the arrival of Red.

**Urban Fortress.**<sup>1</sup> With friendly forces already controlling the city, this operational concept seeks to minimize the amount of fighting inside the city. By keeping the fight outside of the urban area, the advantages of US air support and long-range fire support could be maximized and damage to the city minimized. The defenses around the city would be composed of three rings (see the summary graphic depicted in Figure D–2, page D–9).

- ▶ **Outer ring.** Aerospace and ground reconnaissance assets would provide detection capabilities for the outer ring (notionally 5 to 50 kilometers out from the city's edge). Detecting approaching Red forces would be easier because they would be on the move, and moving toward a known destination (and possibly in open terrain). As Red forces are located, US aircraft and/or artillery would engage.<sup>2</sup>
- ▶ **Middle ring.** As Red forces leak through to the middle ring (notionally 0 to 5 kilometers out from the city's edge), they could be detected by more aerospace and ground reconnaissance assets and a large number of observer teams distributed around the city's periphery. These Red units would be engaged by all of the long-range systems already mentioned along with short-range direct fire systems (e.g., tanks, ATGMs (Anti-Tank Guided Missile/Munition), APCs (armored personnel carriers)). These shorter-range systems would use the cover provided by the urban terrain to their maximum advantage. Various barriers would be emplaced to channelize and slow Red forces approaching the city. Depending on the terrain, it may be possible to slow the Red force at a considerable distance from the city. The Joint Force Commander (JFC) may or may not decide to sortie out ground elements of his force to engage Red outside of the city, depending on the situation.
- ▶ **Inner ring.** The city itself would compose the inner ring, where preparations would be made to limit any Red penetrations. Barriers could be set up to slow vehicular movement along roads and bridges. If the local populace was willing, a network of civilian observers could be stood up to monitor and track those penetrations. Such a network would provide the JFC with greatly improved situational awareness within the city while absorbing little of his own manpower.

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<sup>1</sup> An operational concept not addressed in the CAPTURE AN URBAN AREA mission.

<sup>2</sup> A 2000 Rand study describes a similar operational concept. See Alan Vick et al. *Aerospace Operations in Urban Environments* (Santa Monica, Ca.: Rand, 2000), pp. 21–25.



**Segment and Capture/Isolate.** Attacking Red forces may succeed in gaining footholds in the city. The difficulty in dislodging those Red forces will be directly related to the amount of territory they control. Therefore, quickly sealing off any penetration of the city from further expansion will be critical. Those Red forces should then be cut off from their supply and reinforcement sources outside the city. Once those two steps have been taken, then the difficult task of eliminating those forces can be completed.

**Frontal Assault.** Attacking Red forces may succeed in gaining footholds in the city and this would be one option for dislodging them.

**Rubble-ize.** Attacking Red forces may succeed in gaining footholds in the city and this would be one option for dislodging them.

### **Isolate/Neutralize a City**

This mission involves two possible targets, a Red force inside of the city or the city itself.

- ▶ The first would be eliminating the ability of a Red force in a city to attack targets outside of the city. Red's offensive capability, to either sortie out of the city or attack from within the city using long-range weapon systems, would be the focus. Neither the continued existence of the Red force, nor its control of the city, would necessarily be counter to the success of the mission.
- ▶ The second possible target would be the city itself. Cutting off a city from its external sources of support might be used to influence events within the city. The same action could be done to affect events at some distance from the city. Cutting off a key industrial city from the rest of a country could put severe economic pressure on the entire nation.

**Rubble-ize.** One option for neutralizing the threat from Red's long-range strike assets would be the extensive use of firepower against their suspected locations in the city.

**Siege.** By sealing Red forces in a city, their ability to sortie out and place US forces or allies at risk would be reduced. This operational concept would also serve to cut off the city from outside sources of support and outside sources from the support offered by the city.

**Precision Strike.** The Red force in a city may have elements capable of attacking at long range. In that case, using precision-strike systems to eliminate those long-range attack assets could neutralize Red's offensive capability.

**Nodal Isolation.** The Red force in the city might lose its offensive capability if it were denied the use of certain critical nodes within the city.

## Destroy/Capture an Enemy Force

This mission requires the destruction or capturing of a Red force in a city.

**Rubble-ize.** The aggressive use of firepower might be sufficient to eliminate the enemy force or make its capture much easier.

**Frontal Assault.** If locating the Red force proves problematic, then a sweep across the entire urban area may be necessary.

**Nodal Capture and Expansion.** The capture of certain critical nodes may substantially facilitate the destruction and/or capture of the Red force.

**Soft-Point Capture and Expansion.** The capture of undefended sections of the city might provide advantage from which to later destroy or capture the Red force.

**Segment and Capture/Isolate.** A Red force that has nowhere to retreat may be easier to capture or destroy.

**Siege.** Cutting off the Red force from outside resupply and reinforcement could weaken it and make eventual capture and/or destruction easier.

**Precision Strike.** It may be possible to destroy most or all of the Red force with standoff munitions.

**Nodal Isolation.** Loss of the use of certain critical nodes might substantially weaken the Red force and make its capture and/or destruction easier.

## Focused Offensive

With this mission offensive operations are conducted against some subset of the city. This subset could be a specific geographic region like a political party headquarters, a government building, a central business district, or a shantytown. Or the target could be a specific military element in the city (e.g., a specific unit or leader). The target might be a portion of the city's infrastructure, disabling it for the short term or long term. Yet another target might be the will of the Red force, a neutral force, or the local civilian population.

**Rubble-ize.** If the target were a particular section of the city, one option could be to level it.

**Segment and Capture/Isolate.** By denying Red the retreat option and preventing other elements of the Red force from lending assistance, capturing a leader or facility would be easier.

**Siege.** Cutting off the Red force from outside resupply and reinforcement would weaken it. This would make any subsequent attack on territory controlled by Red, or the Red force itself, more effective. Laying siege to a city would also cut off the escape routes for any leaders that Blue wishes to capture.

**Precision Strike.** Capturing a facility may require the elimination of forces guarding the facility without destroying the facility itself.

**Nodal Isolation.** Sometimes the target might not be a physical entity. Demonstrating the ability to affect utility distribution in the city could affect the mindset of the Red force and/or civilian population. Denying Red access to media outlets could bolster Blue psychological operations directed at the civilian population.

### Focused Defensive

This mission entails the defense of some subset of the city. This subset could include a specific geographic region or point (e.g., an embassy, an airport, a neighborhood), a portion of the population (e.g., US citizens, an ethnic minority, a local leader), a group operating in the city (e.g., non-governmental organizations, or NGOs), a friendly military unit(s), or a portion of the city's infrastructure (e.g., water supply, power plants, bridges). The duration of the effort will vary depending on the mission and the defensive measures taken do not necessarily require that the protected party remain in the city (e.g., Noncombatant Evacuation Operations, or NEOs).

**Rubble-ize.** The aggressive use of firepower may be necessary to defend against strong Red attacks, especially if Blue forces are defending an isolated location with limited retreat options.

**Segment and Capture/Isolate.** If the Red force is prevented from massing a large part of its force against a target, defending that location will be easier.

**Precision Strike.** Destroying key elements of the Red force would substantially limit its ability to attack any Blue defended target.

**Nodal Isolation.** It may be possible to weaken the Red force by denying it the use of key nodes in the city. In a weakened state the Red force would be less able to threaten any Blue defended targets.

### Neutralize Combatants

This mission aims to reduce or eliminate a conflict in the city between two or more parties. Separating and/or disarming those involved may or may not be required. Efforts could be targeted on either the will to fight, the ability to fight, or both.

**Siege.** Cutting off the various combatants from outside supply might reduce their capacity for hostile action.

**Segment and Capture/Isolate.** Separating combatants will be much easier if the mobility of those combatants is reduced. Fixing in place the various hostile forces will make the flash points more predictable and more controllable.

**Precision Strike.** Destroying key elements (e.g., equipment or leadership targets) within each combatant's force might make each side less capable and/or willing to fight (peace enforcement vs. peacekeeping).

**Nodal Isolation.** Without access to certain key nodes in the city, a combatant force might not be able to continue hostilities.

## **Humanitarian Assistance**

This involves rendering assistance to alleviate large-scale human suffering and/or a risk to human life. The source of the crisis may be man-made or a natural disaster.

**Infrastructure Augmentation.**<sup>3</sup> The population in any given city requires a great deal of logistical support (e.g., food, water, medical, police) from the local infrastructure on a daily basis. That supporting infrastructure might be damaged by conflict or natural disaster. The loss of local logistical support would imperil a great many civilian lives and could quickly lead to unrest. (Figure D–2 on the next page depicts this unfolding complexity.)

This operational concept focuses on getting the local infrastructure quickly restored. The JTF (Joint Task Force) would repair damaged facilities, manage operations, and assist in distribution as needed. Close coordination would be required with local officials and NGOs present in the city. Some forms of support not locally available, or being provided by outside NGOs, would have to come directly from the JTF. Infrastructure support duties would require JTF personnel to be dispersed across the city. Such a deployment would best be reserved for low-threat environments. Logistical support units spread out in this manner would be vulnerable and have difficulty coordinating actions if confronted by a substantial Red force.

**Segment and Capture/Isolate.** Protecting food stockpiles and distribution points may require the establishment of protected zones. Otherwise, marauding crowds might overrun these locations and disrupt efficient food, water, and medical distribution efforts.

## **Civil Support in the United States**

During a civil disturbance, natural disaster, or WMD (weapons of mass destruction) attack, the local authorities might require assistance in maintaining order and providing services to the population. Casualties among local government workers, damage to infrastructure, and mass panic among the population could all contribute to a situation beyond the control of the local authorities. The JTF would assist the local authorities across a range of activities aimed at supporting the local population.

**Infrastructure Augmentation.** The population in any given city requires a great deal of logistical support (e.g., food, water, medical, police) from the local infrastructure on a daily basis. That supporting infrastructure might be damaged by conflict or natural disaster. The loss of local logistical support would imperil a great many civilian lives and could quickly lead to unrest. This operational concept focuses on getting the local

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<sup>3</sup> Another operational concept not explicitly addressed in the CAPTURE AN URBAN AREA mission.

infrastructure quickly restored. The JTF would repair damaged facilities, manage operations, and assist in distribution as needed. Close coordination would be required with local officials and NGOs present in the city. Some forms of support not locally available, or being provided by outside NGOs, would have to come directly from the JTF. Infrastructure support duties would require JTF personnel to be dispersed across the city.

**Segment and Capture/Isolate.** Local law enforcement agencies would benefit if US military forces restricted the mobility of criminal elements (and mobs) during a time of civil disorder.

### Capabilities Needed for the Two Additional Operational Concepts

In looking at the two additional operational concepts listed for these eight other urban missions (see Figure D–2 below), the next step is to determine if they require additional capabilities. For this paper, we determined that these two concepts did not require any capabilities beyond the 31 previously listed (see Chapter III). There are two reasons for this.

- ▶ First, many of the capabilities needed for Urban Fortress related to non-urban specific, open-terrain capabilities. The remaining required capabilities are already covered by those listed for Frontal Assault, and the other operational concepts that involve fighting substantial ground forces in urban terrain.
- ▶ The second reason is that the concept of Infrastructure Augmentation is really a subset of the CAPTURE AN URBAN AREA mission. In breaking down the CAPTURE AN URBAN AREA mission, it was assumed that at least some repair and management of infrastructure would be needed for areas of the city under Blue control, particularly during the Consolidate and Transition components of that mission. Therefore, the capabilities to do that were covered in the CAPTURE AN URBAN AREA mission.

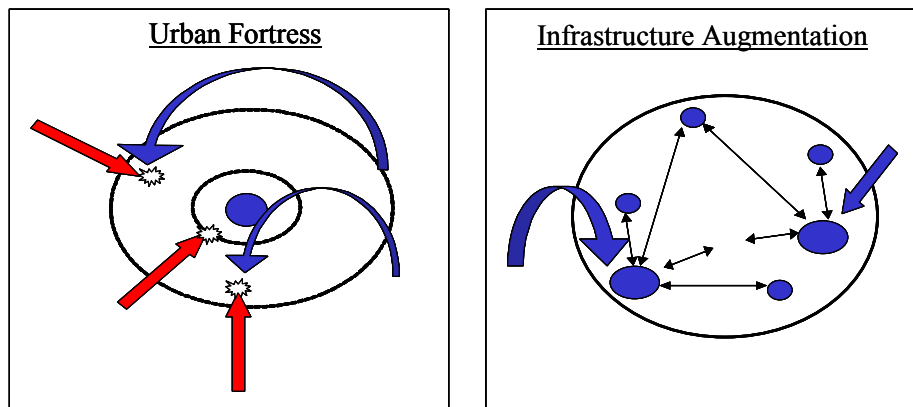


Figure D–2. Summary of Operational Concepts Not Addressed Under Capture an Urban Area



**Appendix E.  
Relationship Between the Urban  
Roadmap and the Joint Warfighting  
Science and Technology Plan**





## Contents

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U1	The ISR (intelligence, surveillance, and reconnaissance) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic. ....	6
U2	The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.....	6
U3	The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.....	7
US4	The ability to command and control units operating in the urban environment where radio and GPS systems work poorly.....	7
UST5	Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries. ....	8
U6	The ISR capability to generate an in-depth understanding of the city's population and its likely future actions/reactions. ....	8
U7	The ability to do BDA (Battle Damage Assessment) for attacks using non-lethal and non-kinetic weapons.....	8
U8	The ISR ability to rapidly generate 3D, small-scale, up to date digital maps of the urban battlespace that include subterranean features and possibly building interiors.....	9
U9	Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces. ....	9
U10	The ability to detect and neutralize mines, booby traps, and toxic chemicals. ....	9
S1	The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces. ....	9
S2	The ability to maintain a secure front line within the city to prevent enemy movement into "cleared" areas. ....	10
S3	Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.....	10
S6	Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city. ....	10

S7	Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion.....	11
S8	Capabilities to communicate with, coordinate with, and influence the local populace..	11
S9	The ability to mislead Red as to the movement and location of Blue forces in the city.	11
S10	Conduct small-unit combined arms operations.....	12
S11	Medical capabilities to protect Blue personnel from disease, psychological stress, and hazardous materials.....	12
S12	Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat .....	12
S13	The ability to selectively disable utility and communication systems in a city for the short or long term. ....	13
S14	Improve infantry’s mobility over urban obstacles. ....	13
E1	The ability to destroy wide area targets.....	13
E2	The ability to destroy point targets with minimal collateral damage. ....	13
E3	The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.....	14
E4	Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings. ....	14
E5	Sniper and counter-sniper capabilities. ....	15
E6	Urban fire support.....	15
C1	Infrastructure management and repair capabilities. ....	16
C2	Capabilities to reestablish the rule of law in portions of the city under Blue control...	16
C3	The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure. ....	16
Annex.	S&T Programs and Their Associated Capabilities .....	18

Chapter eight of the 2001 *Joint Warfighting Science and Technology Plan*<sup>1</sup> (JWSTP) addresses Science and Technology (S&T) programs relevant to military operations on urbanized terrain (MOUT), among them:

A.06	Rapid Terrain Visualization Advanced Concept Technology Demonstration (ACTD)
BE.08	Rapid Mapping Technology
E.01	Small-Unit Operations Technology Demonstration (TD)
E.02	Military Operations in Urbanized Terrain ACTD
E.04	Joint Non-Lethal Weapons
HS.05	Ballistic Protection for Improved Individual Survivability
HS.12	Helmet-Mounted Sensory Ensemble
HS.17	Panoramic Night Vision Goggle Technology
HS.21	Decision Support Systems for Command and Control
HS.25	Multifunctional Fabric System
HS.32	Strike Helmet 21
IS.40	Individual Combatant and Small-Unit Operations Simulation
M.02	Extending the Littoral Battlespace ACTD
M.06	Precision-Guided Mortar Munition ATD
M.12	Load Carriage Optimization for Enhanced Warfighter Performance
MP.05.01	Protective Materials for Combatant and Combat Systems Against Conventional Weapons
SE.06	Next-Generation Multifunction Electro-Optical Sensor System
SE.09	Multi-Wavelength, Multifunction Laser
SE.33	Advanced Focal Plane Array Technology
WE.34	Objective Crew-Served Weapon ATD

These programs span a wide range of the needs for future MOUT operations. However, having the proper materiel is only one part of the equation. Other factors, such as doctrine, organization, training, leadership, materiel, personnel, facilities, and policy, also contribute. These other factors determine if the tools available are used to the fullest. *So while having the proper materiel available does not automatically equal a capability, the lack thereof can prevent it.* Given that role delineation, these programs were analyzed for their potential contribution across the list of needed MOUT capabilities this Urban Roadmap has developed.

Below is the list of the 31 capabilities identified earlier in this document.

- First, each Roadmap capability is listed.<sup>2</sup>

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<sup>1</sup> US Department of Defense, *Joint Warfighting Science and Technology Plan*, (Washington, DC: US Government Printing Office, 2001).

- ▶ Below each capability is listed the S&T programs determined to most likely facilitate that capability.
- ▶ A comments section provides additional details.

Starting on page E-18 is a list that contains the names of the S&T programs with their associated capabilities of Understand, Shape Engage, Consolidate, Transition.

This comparison was limited to those S&T programs included in the MOUT chapter of the JWSTP. There are likely other programs relevant to MOUT currently ongoing. However, this comparison did not address those programs outside chapter eight of the JWSTP.

**U1 The ISR (intelligence, surveillance, and reconnaissance) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battle-space: cultural, political, religious, historical, demographic, economic, military, and geographic.**

**S&T programs:**

- ▶ SE.06, Next-Generation Multifunction Electro-Optical Sensor System
- ▶ SE.09, Multi-Wavelength, Multifunction Laser
- ▶ SE.33, Advanced Focal Plane Array Technology

**Comments:** These three programs provide for improved infrared (IR) and laser sensors. SE.33, Advanced Focal Plane Array Technology, is especially promising via its pursuit of smaller and cheaper IR sensors. The short lines-of-sight in the city are going to require large numbers of sensors that are inexpensive and deployable on small platforms (e.g., micro-unmanned aerial vehicles (UAVs) and small unmanned ground vehicles (UGVs)). Missing is an attention to the softer side of nodal analysis. An IR sensor can tell you if a power plant is operational, but it cannot tell you if a particular religious structure is highly valued by the local population. Technology solutions are needed that would facilitate tapping the HUMINT (human intelligence) potential of the civilian population.

**U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.**

**S&T programs:<sup>3</sup>**

- ▶ E.01, Small-Unit Operations TD

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<sup>2</sup> Each capability was given a letter and number designation. The letter refers to the portion of USECT (Understand, Shape, Engage, Consolidate, Transition) it most directly affects. A few capabilities were deemed to affect several portions of USECT and thus were given multiple letters in their designation (e.g., US4: Urban C<sup>2</sup>). The numbers that follow the letters have no significance other than to distinguish between capabilities.

<sup>3</sup> Two FY 2002 ACTDs, Expendable UAV and Pathfinder, are relevant to the Understand capabilities.

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ HS.12, Helmet-Mounted Sensory Ensemble
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ HS.32, Strike Helmet 21
- ▶ SE.06, Next-Generation Multifunction Electro-Optical Sensor System
- ▶ SE.09, Multi-Wavelength, Multifunction Laser
- ▶ SE.33, Advanced Focal Plane Array Technology

**Comments:** These programs cover a range of solutions to finding Red forces. The one area that may require more emphasis is detecting those forces while indoors or underground. Having even a partial capability in that area would revolutionize MOUT, much like making the oceans transparent would revolutionize anti-submarine warfare.

**U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.**

**S&T programs:**

- ▶ E.01, Small-Unit Operations TD
- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ SE.06, Next-Generation Multifunction Electro-Optical Sensor System
- ▶ SE.09, Multi-Wavelength, Multifunction Laser
- ▶ SE.33, Advanced Focal Plane Array Technology

**Comments:** This capability calls for a very detailed knowledge of Red's activities and plans. Observing the movement of Red forces and supplies will be only a part of the solution. ISR tools are needed that can assess Red's future plans, thus facilitating proactive shaping and engaging by Blue. These tools will need to tap the full span of intelligence (human, signal, measuring and signal, imagery, open source).

**US4 The ability to command and control units operating in the urban environment where radio and GPS systems work poorly.**

**S&T programs:**

- ▶ E.01, Small-Unit Operations TD
- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ HS.21, Decision Support Systems for Command and Control
- ▶ M.02, Extending the Littoral Battlespace ACTD

**Comments:** Command control (C<sup>2</sup>) is one of the central problems with MOUT today. In addition to the environment being hostile to today's military communications systems and GPS (Global Positioning System), the demand on those systems will be greater because of noncontiguous operations. If these programs can develop technologies and systems capable of communicating and providing locations inside buildings and underground, urban C<sup>2</sup> capabilities would be greatly improved.

**UST5 Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.**

**S&T programs:**

- ▶ E.01, Small-Unit Operations TD
- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ HS.21, Decision Support Systems for Command and Control
- ▶ M.02, Extending the Littoral Battlespace ACTD

**Comments:** For this capability the largest hurdles are not materiel. These programs are fairly well aimed at providing the tools for this cooperation. The one key remaining question is the interoperability of the command, control, and communications (C<sup>3</sup>) systems for the various actors in the urban battlespace.

**U6 The ISR capability to generate an in-depth understanding of the city's population and its likely future actions/reactions.**

**S&T programs:** None.

**Comments:** One of the fundamental intelligence needs in MOUT is to understand the civilian population. HUMINT is an essential element in doing that. Needed are technologies that would facilitate communicating with and understanding the civilians. The civilian population themselves have the potential to act as intelligence gathering platforms if they are suitable equipped. Another potential source of information would be non-DoD databases and subject matter experts. Technologies enabling rapid reach-back to these sources is needed.

**U7 The ability to do BDA (Battle Damage Assessment) for attacks using non-lethal and non-kinetic weapons.**

**S&T programs:**

- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ SE.06, Next-Generation Multifunction Electro-Optical Sensor System
- ▶ SE.09, Multi-Wavelength, Multifunction Laser
- ▶ SE.33, Advanced Focal Plane Array Technology

**Comments:** Conventional BDA is a difficult task. BDA for assessing the efficacy of non-lethal and non-kinetic engagements is even more difficult. The subtle effects these weapons impart require sensors that can measure those subtle effects. Without the ability to measure those effects, the utility of those weapons will be substantially degraded.

**U8 The ISR ability to rapidly generate 3D, small-scale, up to date digital maps of the urban battlespace that include subterranean features and possibly building interiors.**

**S&T programs:**

- ▶ A.06, Rapid Terrain Visualization ACTD
- ▶ BE.08, Rapid Mapping Technology
- ▶ SE.09, Multi-Wavelength, Multifunction Laser

**Comments:** These programs do address the generation of 3D maps. They do not appear to address the problems of mapping building interiors and underground terrain features.

**U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ HS.21, Decision Support Systems for Command and Control
- ▶ IS.40, Individual Combatant and Small-Unit Operations Simulation

**Comments:** The complexity of the urban environment makes assessing all the options difficult for a commander. These programs aim at addressing that problem by delegating some of the mental workload to computers.

**U10 The ability to detect and neutralize mines, booby traps, and toxic chemicals.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD

**Comments:** While this problem was addressed as a part of the MOUT ACTD, it warrants further attention. Mines and booby traps are likely to be a staple tool for Red in future MOUT. Without a robust ability to detect and neutralize these threats, Blue mobility will sharply decline while casualties increase.

**S1 The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD;

- ▶ E.04, Joint Non-Lethal Weapons

**Comments:** In the Roadmap's analysis of MOUT, the ability to restrict access to the city was deemed essential. Non-lethal weapons have tremendous potential in this area, given that the most effective barriers will be those that restrict movement without endangering noncombatants.

**S2 The ability to maintain a secure front line within the city to prevent enemy movement into "cleared" areas.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ E.04, Joint Non-Lethal Weapons
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ SE.09, Multi-Wavelength, Multifunction Laser
- ▶ SE.33, Advanced Focal Plane Array Technology

**Comments:** Once some areas of a city are cleared of Red, there may be a need to keep those areas cleared. The ability to restrict the movement of both Red and the civilian population would be a powerful tool to a Joint Force Commander (JFC). Again, non-lethals would excel at this task because of their reduced impact on the noncombatants.

**S3 Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ E.04, Joint Non-Lethal Weapons

**Comments:** The efforts at developing non-lethal weapons will prove very useful in restricting Red mobility. However, the areas of hindering Red C<sup>3</sup> and ISR could use more attention. The advances in commercial communications are likely to be tapped by a future Red force. Developing effective counters to those technologies is warranted. The same can be said for future urban ISR networks. Short lines-of-sight will likely require large numbers of networked sensors. Efforts should be made to counter these networks as well.

**S6 Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.**

**S&T programs:**

- ▶ HS.17, Panoramic Night Vision Goggle Technology



- ▶ MP.05.01, Protective Materials for Combatant and Combat Systems Against Conventional Weapons

**Comments:** While some efforts are being made at improving the survivability for both ground vehicles and helicopters, some low-tech solutions may have been ignored. *The primary threat in MOUT to vehicles is the rocket-propelled grenade (RPG).* Perhaps a simple standoff screen or bar array might prove effective instead of heavy and expensive reactive armor kits, new advanced material armor plates, or active defense suites. The savings in cost and weight would be substantial. Russian forces in Chechnya used both of these low-tech solutions.<sup>4</sup>

**S7 Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion.**

**S&T programs:**

- ▶ HS.05, Ballistic Protection for Improved Individual Survivability
- ▶ HS.25, Multifunctional Fabric System
- ▶ MP.05.01, Protective Materials for Combatant and Combat Systems Against Conventional Weapons

**Comments:** For CSS personnel and equipment, MOUT requires greater attention to force protection. Resupply and other support missions are going to be conducted in proximity to Red forces. This necessitates lightweight armor for CSS vehicles, and body armor for all personnel.

**S8 Capabilities to communicate with, coordinate with, and influence the local populace.**

**S&T programs:** None.<sup>5</sup>

**Comments:** This relates closely to the discussion under U6 (page 8). Tools are needed to better interact and influence the populace. The bad news is that they—the population—cannot be ignored (without incurring serious costs). The good news is that they can be shaped into an asset rather than a liability. The commercial communications industry has figured out how to keep people constantly in touch in any environment. Those COTS (commercial off-the-shelf) technologies should be explored for their utility in dealing with a civilian population.

**S9 The ability to mislead Red as to the movement and location of Blue forces in the city.**

**S&T programs:** None.

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<sup>4</sup> During the battle for Berlin, Soviet tank crews began affixing mattress box springs to their tanks for protection from German Panzerfausts (the first effective man-portable anti-tank weapon). Cornelius Ryan, *The Last Battle: The Classic History of the Battle for Berlin* (New York: Simon and Schuster, 1966), p. 391.

<sup>5</sup> An FY 2002 ACTD, Language and Speech Exploitation Resources, is relevant to this capability.

**Comments:** The wealth of cover provided by the urban environment can be made to work to Blue's advantage. That cover can come in the form of physical obstruction of vision, or it can come from the overall background noise of activity in the city. There should be some exploration of technologies that can leverage those facets of the urban environment to mislead Red.

**S10 Conduct small-unit combined arms operations.**

**S&T programs:**

- ▶ E.01, Small-Unit Operations TD
- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ MP.05.01, Protective Materials for Combatant and Combat Systems Against Conventional Weapons.

**Comments:** This is another one of those areas where the most significant hurdles are not materiel related, with training and doctrine being key to the success of small-unit arms operations. Where these programs do help out is in facilitating communications, and improving the survivability of both dismounted infantry and vehicles.

**S11 Medical capabilities to protect Blue personnel from disease, psychological stress, and hazardous materials.**

**S&T programs:** None.

**Comments:** The urban environment poses some unique medical threats to Blue. The density of the civilian population will make infectious diseases a part of the landscape. Industrial facilities are going to house a range of hazardous material (HAZMAT). The proximity of combatants will overstress Blue personnel faster than non-urban combat. Technological solutions should be explored that can mitigate these threats.

**S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ HS.05, Ballistic Protection for Improved Individual Survivability
- ▶ HS.25, Multifunctional Fabric System
- ▶ MP.05.01, Protective Materials for Combatant and Combat Systems Against Conventional Weapons

**Comments:** Improved protection for dismounted personnel is essential for MOUT. These programs aim to address most of the threats identified in this Roadmap capability, save for "blast." The greater overpressure generated by indoor detonations could prove to be a sig-

nificant future casualty producer. Weapons optimized to produce greater overpressure have already been used in urban conflicts (e.g., thermobaric weapons in Grozny).

**S13 The ability to selectively disable utility and communication systems in a city for the short or long term.**

**S&T programs:**

- ▶ E.04, Joint Non-Lethal Weapons

**Comments:** The local infrastructure of a city will be a central element in the logistical equation. It can sustain both Blue and the civilian population, and it can also be used by Red. In many cases Blue will become responsible for some portion of the populace. Supporting that population without the assistance of the local infrastructure would be very difficult. Technologies should be explored that would allow a city's infrastructure to be remotely and selectively disabled without causing long-term damage.

**S14 Improve infantry's mobility over urban obstacles.**

**S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ M.12, Load Carriage Optimization for Enhanced Warfighter Performance

**Comments:** For dismounted infantry, an urban environment involves a lot of vertical movement along with movement in confined spaces. These two factors place a premium on low weight and bulk for an infantryman's gear. These two programs should contribute to progress in both these areas.

**E1 The ability to destroy wide area targets.**

**S&T programs:** None.

**Comments:** While no programs were identified as contributing to this capability, the Urban Roadmap concluded that current capabilities in this area were good.

**E2 The ability to destroy point targets with minimal collateral damage.**

**S&T programs:**

- ▶ E.04, Joint Non-Lethal Weapons
- ▶ HS.12, Helmet-Mounted Sensory Ensemble
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ HS.32, Strike Helmet 21
- ▶ M.06, Precision-Guided Mortar Munition ATD

**Comments:** Hitting urban targets precisely without causing collateral damage is difficult. Munition trajectories can be blocked, targets can be fleeting, and nearby structures can be

fragile. These programs address advanced targeting systems for pilots, non-lethal weapons, improved night-vision devices, and precision mortars. One area that would benefit from further exploration is a range of smaller precision-guided munitions with both agile flight trajectories and dial-able effects.

### **E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.**

#### **S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ E.04, Joint Non-Lethal Weapons
- ▶ HS.05, Ballistic Protection for Improved Individual Survivability
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ M.12, Load Carriage Optimization for Enhanced Warfighter Performance
- ▶ MP.05.01, Protective Materials for Combatant and Combat Systems Against Conventional Weapons

**Comments:** These programs are aimed at a broad spectrum of needs for building clearing. Perhaps the biggest payoffs will come in the through-wall sensor area. Red forces are just as limited as Blue by the vastness of the urban battlespace. A building with 400 rooms is not likely to have Red forces in but a small portion of those rooms. Being able to detect which rooms those are, preferably prior to entry, would dramatically reduce the risk to Blue personnel, the time needed to clear the building, the number of personnel needed, the risks to any noncombatants in the building, and collateral damage to the building itself.

### **E4 Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.**

#### **S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ E.04, Joint Non-Lethal Weapons

**Comments:** Like any other exploitable terrain feature, Red is likely to take advantage of the presence of noncombatants. Even barring purposeful efforts by Red to do this, the presence of noncombatants will act as a restraint on Blue actions. However, if the Blue force possesses a range of non-lethal tools that allow it to impart effects onto, or in proximity to non-combatants, then that opens up a lot of options not currently available. Two desirable performance parameters for non-lethals are rapidly affecting large areas and imparting effects into structures. If future non-lethal systems can achieve both of these, they will greatly increase a JFC's capability.

## **E5 Sniper and counter-sniper capabilities.**

### **S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ E.04, Joint Non-Lethal Weapons
- ▶ HS.05, Ballistic Protection for Improved Individual Survivability
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ MP.05.01, Protective Materials for Combatant and Combat Systems Against Conventional Weapons
- ▶ WE.34, Objective Crew-Served Weapon ATD

**Comments:** Dealing with the sniper threat requires a three-layered approach:

- ▶ The first layer is early detection of the sniper.
- ▶ The second is rapid location and engagement of the sniper once a shot has been taken.
- ▶ The third layer is improved body armor for personnel.

These programs address each of these layers. One area that may require further emphasis is the second layer, the rapid location and engagement of the sniper. Semi-automated detection and return fire systems, especially with weapons effective against targets behind cover, could revolutionize counter-sniper capabilities. WE.34, Objective Crew-Served Weapon ATD, is currently pushing this capability now.

## **E6 Urban fire support.**

### **S&T programs:**

- ▶ E.02, Military Operations in Urbanized Terrain ACTD
- ▶ E.04, Joint Non-Lethal Weapons
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ HS.32, Strike Helmet 21
- ▶ M.06, Precision-Guided Mortar Munition ATD
- ▶ WE.34, Objective Crew-Served Weapon ATD

**Comments:** These programs address a range of issues associated with urban fire support. One area that could benefit from further efforts would be launch platforms that can loiter while remaining survivable, and munitions with dial-able effects and agile flight trajectories.

## **C1 Infrastructure management and repair capabilities.**

### **S&T programs:**

- ▶ A.06, Rapid Terrain Visualization ACTD
- ▶ BE.08, Rapid Mapping Technology
- ▶ HS.21, Decision Support Systems for Command and Control

**Comments:** These programs begin to address this need, by improving knowledge of the physical location of facilities, and by improving C<sup>2</sup> decision-making. However, still needed are technologies that allow a JFC to rapidly repair and operate infrastructure with a minimum of personnel and logistical support.

## **C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.**

### **S&T programs:**

- ▶ E.04, Joint Non-Lethal Weapons
- ▶ HS.17, Panoramic Night Vision Goggle Technology
- ▶ SE.33, Advanced Focal Plane Array Technology

**Comments:** The two key elements to this capability are sensors and non-lethal tools, both of which benefit from these programs. Large numbers of networked sensors are necessary to economize on personnel usage. Non-lethals are required to maintain control with a reduced risk of inciting hostile local and international reactions.

## **C3 The capabilities to mitigate the effects of WMD use on urban civilian populations and infrastructure.**

**S&T programs:** None.

**Comments:** Currently, U.S. forces are fairly well prepared to protect themselves against the chemical or biological threat. The difficulty comes in extending that protection to a civilian population. A second problem is how portions of a city's critical infrastructure could be de-contaminated rapidly after a chemical or biological use. Technologies are needed that would enhance capabilities in both these areas.

### **Summary**

The programs listed in the JWSTP's chapter on MOUT address many of the current short-falls in capabilities. As a whole, they have the potential to impart major improvements to our MOUT capabilities. However, in doing a comparison to the Roadmap's list of needed MOUT capabilities, some areas that appear to be in need of attention or increased emphasis include:

- ▶ improving the ability to communicate with and influence noncombatants
- ▶ improving the ability to conduct HUMINT operations

- ▶ improving the ability to reach-back to non-organic sources of information,
- ▶ detecting personnel or equipment inside structures or underground,
- ▶ better discerning Red's future plans,
- ▶ conducting BDA for the subtle effects of non-lethal and non-kinetic weapons,
- ▶ mapping building interiors and underground structures
- ▶ improving mine/booby trap detection and neutralization
- ▶ hindering Red C<sup>3</sup> and ISR
- ▶ developing low-tech standoff armor for RPG protection
- ▶ leveraging the cover provided by the urban environment to obscure Blue movement and location
- ▶ improving protection for personnel from blast, HAZMAT, infectious disease, and psychological stress
- ▶ remotely and selectively disabling a city's infrastructure
- ▶ rapidly repair and manage a city's infrastructure with a minimum of personnel and logistical support
- ▶ smaller munitions that have dial-able effects and agile flight trajectories
- ▶ semi-autonomous counter-sniper systems that can rapidly detect and return fire with weapons effective versus targets behind cover
- ▶ extending some level of chemical and/or biological protection to noncombatants and improving decontamination capabilities for local infrastructure

## Annex. S&T Programs and Their Associated Capabilities

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### **A.06 Rapid Terrain Visualization Advanced Concept Technology Demonstration (ACTD)**

- U8 The ISR ability to rapidly generate 3D, small-scale, up to date digital maps of the urban battlespace that include subterranean features and possibly building interiors.
- C1 Infrastructure management and repair capabilities.

### **BE.08 Rapid Mapping Technology**

- U8 The ISR ability to rapidly generate 3D, small-scale, up to date digital maps of the urban battlespace that include subterranean features and possibly building interiors.
- C1 Infrastructure management and repair capabilities.

### **E.01 Small-Unit Operations Technology Demonstration (TD)**

- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.
- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- US4 The ability to command and control units operating in the urban environment where radio and GPS systems work poorly.
- UST5 Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.
- S10 Conduct small-unit combined arms operations.

### **E.02 Military Operations in Urbanized Terrain ACTD**

- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.
- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- US4 The ability to command and control units operating in the urban environment where radio and GPS systems work poorly.
- UST5 Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.
- U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces.
- U10 The ability to detect and neutralize mines, booby traps, and toxic chemicals.
- S1 The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.
- S2 The ability to maintain a secure front line within the city to prevent enemy movement into “cleared” areas.
- S3 Restrict Red’s ability to react via fire or movement. This would include



restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.

- S10 Conduct small-unit combined arms operations.
- S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.
- S14 Improve infantry's mobility over urban obstacles.
- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
- E4 Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.
- E5 Sniper and counter-sniper capabilities.
- E6 Urban fire support.

#### **E.04 Joint Non-Lethal Weapons**

- S1 The ability to create barriers on the perimeter of the city to prevent outside reinforcement and resupply of enemy forces.
- S2 The ability to maintain a secure front line within the city to prevent enemy movement into "cleared" areas.
- S3 Restrict Red's ability to react via fire or movement. This would include restricting the physical ability to move and fire, restricting the ability to command and control movement and fires, and restricting the inflow of information Red needs to make decisions on movement and fires.
- S13 The ability to selectively disable utility and communication systems in a city for the short or long term.
- E2 The ability to destroy point targets with minimal collateral damage.
- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
- E4 Non-lethal capabilities for dealing with crowds and Red, both inside and outside of buildings.
- E5 Sniper and counter-sniper capabilities.
- E6 Urban fire support.
- C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.

#### **HS.05 Ballistic Protection for Improved Individual Survivability**

- S7 Conduct resupply and casualty evacuations on the "front line" for units operating in a contiguous fashion.
- S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.
- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
- E5 Sniper and counter-sniper capabilities.

#### **HS.12 Helmet-Mounted Sensory Ensemble**

- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.

E2 The ability to destroy point targets with minimal collateral damage.

**HS.17 Panoramic Night Vision Goggle Technology**

- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.
- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- U7 The ability to do BDA (Battle Damage Assessment) for attacks using non-lethal and non-kinetic weapons.
- S2 The ability to maintain a secure front line within the city to prevent enemy movement into “cleared” areas.
- S6 Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.
- E2 The ability to destroy point targets with minimal collateral damage.
- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
- E5 Sniper and counter-sniper capabilities.
- E6 Urban fire support.
- C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.

**HS.21 Decision Support Systems for Command and Control**

- US4 The ability to command and control units operating in the urban environment where radio and GPS systems work poorly.
- UST5 Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.
- U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces.
- C1 Infrastructure management and repair capabilities.

**HS.25 Multifunctional Fabric System**

- S7 Conduct resupply and casualty evacuations on the “front line” for units operating in a contiguous fashion.
- S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.

**HS.32 Strike Helmet 21**

- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.
- E2 The ability to destroy point targets with minimal collateral damage.
- E6 Urban fire support.

**IS.40 Individual Combatant and Small-Unit Operations Simulation**

- U9 Software and hardware tools that allow for rehearsal and the assessment of courses of action. These tools would use digital map information and updated intelligence information on Red, Blue, and White forces.

**M.02 Extending the Littoral Battlespace ACTD**

- US4 The ability to command and control units operating in the urban environment where radio and GPS systems work poorly.
- UST5 Coordination capabilities across Service, agency, coalition partner, and NGO (non-governmental organization) boundaries.

**M.06 Precision-Guided Mortar Munition ATD**

- E2 The ability to destroy point targets with minimal collateral damage.
- E6 Urban fire support.

**M.12 Load Carriage Optimization for Enhanced Warfighter Performance**

- S14 Improve infantry's mobility over urban obstacles.
- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.

**MP.05.01 Protective Materials for Combatant and Combat Systems Against Conventional Weapons**

- S6 Intra-urban transport capability (land and air) for moving forces, supplies, and wounded to isolated locations within a city.
- S7 Conduct resupply and casualty evacuations on the "front line" for units operating in a contiguous fashion.
- S10 Conduct small-unit combined arms operations.
- S12 Improved protection for dismounted personnel from small arms, fragmentation, blast, and heat.
- E3 The ability to rapidly clear buildings with low Blue casualties and a minimum of Blue personnel.
- E5 Sniper and counter-sniper capabilities.

**SE.06 Next-Generation Multifunction Electro-Optical Sensor System**

- U1 The ISR (intelligence, surveillance, and reconnaissance) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.
- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.
- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- U7 The ability to do BDA (Battle Damage Assessment) for attacks using non-lethal and non-kinetic weapons.

**SE.09 Multi-Wavelength, Multifunction Laser**

- U1 The ISR (intelligence, surveillance, and reconnaissance) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.
- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.

- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- U7 The ability to do BDA (Battle Damage Assessment) for attacks using non-lethal and non-kinetic weapons.
- U8 The ISR ability to rapidly generate 3D, small-scale, up to date digital maps of the urban battlespace that include subterranean features and possibly building interiors.
- S2 The ability to maintain a secure front line within the city to prevent enemy movement into “cleared” areas.

**SE.33 Advanced Focal Plane Array Technology**

- U1 The ISR (intelligence, surveillance, and reconnaissance) capability to discern what is a node (not necessarily a structure) along with which ones the enemy controls. This involves a comprehensive and in-depth understanding of all levels of the battlespace: cultural, political, religious, historical, demographic, economic, military, and geographic.
- U2 The ISR ability to locate and identify enemy forces, including when they are in proximity to friendly forces or intermixed with civilians.
- U3 The ISR capability to discern Red movement patterns, logistical methods, and intentions for both.
- U7 The ability to do BDA (Battle Damage Assessment) for attacks using non-lethal and non-kinetic weapons.
- S2 The ability to maintain a secure front line within the city to prevent enemy movement into “cleared” areas.
- C2 Capabilities to reestablish the rule of law in portions of the city under Blue control.

**WE.34 Objective Crew-Served Weapon ATD**

- E5 Sniper and counter-sniper capabilities.
- E6 Urban fire support.

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## Appendix G. Glossary





3D	three dimensional
AAV	amphibious assault vehicle
ACTD	Advanced Concept Technology Demonstration
AD-P	Area Denial to Personnel
ADS	Active Denial System
AD-V	Area Denial to Vehicles
AF	Air Force
AFB	Air Force Base
AJCS	Adaptive Joint Command and Control
ALSA	Air Land Sea Application
AOACMT	Attack Operations Against Critical Mobile Targets
ASD	Assistant Secretary of Defense
AT&L	Acquisition, Technology, and Logistics (Office of the Under Secretary of Defense)
ATDs	Advanced Technology Demonstrations
ATO	Air Tasking Order
BDA	battle damage assessment
BRAC	Base Realignment and Closure
C2W	Control warfare
C3	command, control, and communications
C3I	command, control, communications, and intelligence
C4	command, control, communications, and computers
C4ISR	command, control, communications, computers, intelligence, surveillance, and
CACTF	Combined Arms Collective Training Facilities
CALCM	Conventional Air Launched Cruise Missile
CAMTF	Combined Arms Military Operations on Urbanized Terrain (MOUT) Task Force
CAPT	Captain, Navy
CAS	Close Air Support
CAT	Computer-aided tomography
CC	Crowd Control
CDC	Crowd Dispersal Cartridge
CENTCOM	Central Command (US)
CEP	Concept Exploration Program; Circular Error Probability
CETO	Center for Emerging Threats and Opportunities
CFAC	Clear Facilities
CIMIC	Civil Military Cooperation
CINC	commander in chief

CJCS	Chairman, Joint Chiefs of Staff
CJCSM	Chairman, Joint Chiefs of Staff Manual
CMO	Civil Military Operations
CMOC	Civil-Military Operations Task Force or Civil-Military Operations Center
COL	Colonel, Army
Col	Colonel, Marine Corps
COMINT	Communications Intelligence
CROP	Common Relevant Operational Picture
CSS	Combat Service Support
CTEIP	Central Test and Evaluation Investment Program
CTF	Collective Training Facilities
DARPA	Defense Advanced Research Projects Agency
DASD RP&CP	Deputy Assistant Secretary of Defense for Requirements, Plans, and Counter-
DIA MOBA	Defense Intelligence Agency Military Operations in Built-Up Area
DIUWG	Defense Intelligence Urban Working Group
DJ8	Joint Staff Director for Force Structure, Resources and Assessment
DoD	Department of Defense
D-O-T-L-S	Doctrine, Organization, Training, Leadership, Soldiers
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership, People, Facilities
DPG	Defense Planning Guidance
DSB	Defense Science Board
DSC	Decision Support Center
D-T-L-O-M-S	Doctrine, Organization, Training, Leadership, Materiel, Soldiers
DTTSG	Defense Test and Training Steering (Group)
ELB	Extend the Littoral Battlespace
EMP	electro-magnetic pulse
EO/IR	electro-optical/infrared
ERGM	Extended Range Guided Munition
FFRDCs	Federally Funded Research and Development Centers
FYDP	Future Year Defense Plan
GAO	General Accounting Office
GPS	Global Positioning System
GVS	Ground vehicle system
HITL	human-in-the-loop

HUMINT	Human Intelligence
IADS	Integrated Air Defense System
IC	Intelligence Community
IDA	Institute for Defense Analyses
IFFN	the identification of friend, foe, and/or neutral
IGO	international governmental organizations
INCAP	Incapacitate Personnel
INS	Inertial Navigation System
IPB	Intelligence Preparation of the Battlespace
IR	infrared
IRCM	Infrared countermeasures
ISR	intelligence, surveillance, and reconnaissance
IUSS	Integrated Unit Simulation System
J8	Joint Staff
JASSM	Joint Air To Surface Standoff Missile
JAWP	Joint Advanced Warfighting Program
JCATS	Joint Conflict and Tactical Simulation
JCLL	Joint Center for Lessons Learned
JDAM	Joint Direct Attack Munition
JFC	Joint Force Commander
JFLs	Joint Futures Labs
JIMP	Joint Implementation Plan
JIP	Joint Interactive Planning
JMAA/JMNA	Joint Mission Area Analysis and Joint Mission Need Analysis
JNLWD	Joint NLW Directorate
JPME	Joint Professional Military Education
JRB	Joint Requirements Board
JROC	Joint Requirements Oversight Council
JSIMS	Joint Simulation and Integrated Modeling System
JSOW	Joint Standoff Weapon
JTF	Joint Task Force
JTS	Joint Training System
JTTRR	Joint Test and Training Range Roadmap
JUOSSG	Joint Urban Operations Self Study Group
JUOWG	Joint Urban Operations Working Group
JUWG	Joint Urban Working group
JV2010	Joint Vision 2010
JVB	Joint Virtual Battlespace

JWAC	Joint Warfare Analysis Center
JWARS	Joint Warfare Simulation
JWCA	Joint Warfighting Capabilities Assessment
JWSTP	Joint Warfighting Science and Technology Plan
LAV	light armored vehicle
LFX	live-fire experiences
LOCPAD	Low-Cost Persistent Area Dominance Miniature Missile
LTA	Limited Technical Analysis
LTC	Lieutenant Colonel, Army
LtCol	Lieutenant Colonel, Marine Corps
M	million (of dollars)
M&S	modeling and simulation
MACOMS	Major Army Commands
MAGTF	Marine Air-Ground Task Force
MAJ	Major, Army
Maj	Major, Marine Corps
MASINT	Measurement/Measuring and Signature Intelligence
MAWTS-1	Marine Aviation Weapons Training Squadron-1
MCAS	Marine Corps Air Station
MCIA	Marine Corps Intelligence Activity
MCWL	Marine Corps Warfighting Laboratory
METL	Mission Essential Tasks List
MEU	Marine Expeditionary Unit
MNA	Missions Needs Analysis
MOE	measures of effectiveness
MOOTW	Military Operations Other Than War
MOUT	Military Operations on Urbanized Terrain
MSI/HIS	Multispectral and Hyperspectral Imaging
MTW	Major Theater War
NATO	North Atlantic Treaty Organization
NBC	nuclear-biological-chemical
NDP	National Defense Panel
NDU	National Defense University
NEO	Noncombatant Evacuation Operation
NETEX	NETworks in the Extreme
NGIC	National Group Intelligence Center
NGO	non-governmental organization

NIMA	National Imagery and Mapping Agency
NLSF	Non-Lethal Slippery Foam
NLW	non-lethal weapons
NSPD	National Security Presidential Directive
NSS	National Security Strategy
OB	order of battle
OICW	Objective Individual Combat Weapon
OPFOR	opposition/opposing force
OPLAN	operation plan
OPTEMPO	operation tempo
OSD	Office of the Secretary of Defense
OUSD	Office of the Under Secretary of Defense
P&R	Personnel and Readiness
PACOM	Pacific Command (US)
PEP	Pulsed Energy Projectile
PERSTEMPO	personnel tempo
PME	Professional Military Education
POC	point of contact
POI	Program of Instruction
POMs	Service Program Objective Memoranda
PVO	private voluntary organizations
QDR	Quadrennial Defense Review
R&D	Research & Development
RDO	Rapid Decisive Operations
RF	radio frequency
RMA	Revolution in Military Affairs
ROE	Rules of Engagement
RSTA	Reconnaissance, Surveillance, and Target Acquisition
S&T	Science and Technology
SAE	Special Area of Emphasis
SDB	Small Diameter Bomb
SIGINT	Signal Intelligence
SOCOM	Special Operations Command
SOF	special operations forces
STOW	Synthetic Theater of War

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TBM	Theater Ballistic Missile
TIRIC	Training Instrumentation Resource Investment Committee
TRAC	US Army Training and Doctrine Command Analysis Center
TRADOC	Training and Doctrine Command
TTP	tactics, techniques, and procedures
UAV	unmanned aerial vehicle
UCAS	Urban Close Air Support
UCAV	Unmanned Combat Air Vehicle
UJTL	Universal Joint Task List
UK	United Kingdom
UPP	Unmanned Powered Parafoil
US/U.S.	United States
USA	US Army
USAF	US Air Force
USAIS	US Army Infantry School
USECT	Understand, Shape, Engage, Consolidate, Transition
USMC	US Marine Corps
USN	US Navy
USR	Unit Status Report
UWG	Urban Working Group
UXO	Unexploded Ordnance
WMD	Weapon(s) of mass destruction







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14. ABSTRACT  DoD is striving for major enhancements of joint warfighting capabilities, and military operations on urbanized terrain (MOUT) are a part of that challenge. The challenge is to improve the urban capabilities of current legacy forces, which have been primarily designed for operations in open environments; and to develop new approaches that address the unique demands of urban operations and that hold the promise of dramatic improvement. The Roadmap in this two-volume paper identifies specific directions and initiatives to pursue that can help improve the capabilities of future joint force commanders (JFCs) to conduct urban operations. The JAWP team drew upon the expertise of dozens of individuals from throughout DoD and non-DoD organizations. By taking the perspective of a future JFC, the Roadmap focuses on the joint operational level. However, strategic and tactical levels are also considered.					
15. SUBJECT TERMS  Military operations on urbanized terrain (MOUT), urban warfare, urban operations, missions, roadmap, operational capabilities, science and technology, joint force commander (JFC), joint operations, task force, intelligence.					
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